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R.S.T's Bold Experiment

A NOTE appeared in this column on March 22 when news of the Rhodesian Selection Trust's share purchase scheme was first announced. The scheme officially started on July 1 and, from the full text of the rules of the scheme now available in London, it is possible to expatiate on the points made earlier and perhaps to press one or two of them rather further.

The general terms of the scheme may be stated briefly. Eligible employees—those earning £200 a year or more—will make their payments—not more than 10 per cent of salary or £25 a month, whichever is the less—to Trustees. The employing company will also pay the Trustees on behalf of each member at the rate of one half of his contributions. The Trustees will buy "A" shares with the employees' cash and "B" shares with the employers'. The member may withdraw his "A" shares at any time but unless he keeps them in the scheme for five years he will not withdraw the whole of his "B" shares. The most unusual feature is that the company guarantees that savings paid into the scheme may be withdrawn intact no matter what may be the fall in market value of the shares bought with them.

No two share purchase plans are alike. Each one is tailor-made to suit the circumstances of the company initiating it. This particular scheme is tailor-made to fit a quite unique industrial circumstance : one in which there is a relatively small and relatively highly paid white labour force working alongside a relatively large and relatively lowly paid black labour force. Indeed, the most striking aspect of the entire scheme is that one of the most sophisticated techniques of personnel relations in capitalist societies has been imported into an industry where settled labour relations are still in the making and where the great proportion of employees have only a meagre notion of company finance.

How well has the tailoring been done? Given the circumstances of the Copperbelt, both excellently and fairly. But it is open to anybody to argue that it was premature to introduce such a scheme before the gap between black and white wage structures had been substantially reduced; for all the oddities of the scheme appear attributable to the great gulf in wage payments.

As was pointed out in our earlier note, the scheme will, in fact, widen the disparity in financial gain that blacks and whites draw from their employment. The entire white labour force will be eligible to join, but by no means all of the black. The maximum contribution is pitched low in relation to the qualifying salary but it will still mean that the more highly paid will tend to take up all their rights and those who just qualify only a part of them.

The guarantee against fall in market value of the "A" shares bought is no doubt a necessary protection for the less well-educated participants. But in the ordinary way a share purchase plan is intended not merely to allow the employee to share the company's profits, it is also intended to teach the employee some of the facts of economic life. It may well be argued that participants in the R.S.T. scheme will get a very odd notion of the rights and risks of the holder of ordinary shares. But this is only another example of how a sophisticated technique has had to be reshaped to fit a primitive industrial situation.

In order to guarantee the take-out value of the " A " shares they have to be kept in the custody of the Trustees. The Trustees will exercise voting rights at the Annual General Meeting. But there are legal difficulties in the way of regarding the Trustees merely as the participants' delegation to the A.G.M. It is by no means clear to what extent, or on what issues, the Trustees can consult with the participants as to how the votes should be cast; in the last resort the Trustees must be plenipotentiaries. This is yet another example of how the educative powers of a share purchase scheme have had to be sacrificed.

All in all this is an exceedingly brave experiment by a company which has an enviable record in promoting industrial harmony. It must be wished well. It is all of a piece with the stated intention of confirming the Group's interests to the Federation. Yet it is difficult not to be impressed by the inherent inappropriateness of technique (as it has so far been used) to situation. Perhaps this is to take too conservative or too pessimistic a view. Perhaps the peculiar adaptation of the scheme will cause the sceptics to be confounded. Those of us who are slightly sceptical would certainly wish to be confounded.

SELF-HELP FOR CANADIAN GOLD MINES

Canada's Emergency Gold Mining Assistance Act was enacted in 1948 for a period of three years for the purpose of assisting the domestic gold mining industry to meet the greatly increased costs of production, for which there had been no compensating increase in the selling price of gold.

The gold mines made strenuous efforts to increase their operating efficiency and to cut costs to a minimum, but despite these efforts working costs continued to rise for reasons outside the industry's control. In addition, the freeing of the Canadian dollar and its subsequent appreciation relative to the U.S. dollar resulted in a decrease in the price received by the mines from the Mint.

These difficulties have persisted and the Act has accordingly been extended from time to time with occasional modifications to meet changing conditions. For the years 1955-58 the rate of assistance is two-thirds of the amount by which the average cost of producing an ounce of gold during the year exceeds $26.50, but in no event does the rate exceed $12.33. The number of assistance ounces is two-thirds of the number of ounces of gold produced in the calendar year.

Examination of the statistics of gold production in recent years indicates that the Act has met with some success. From 2,696,000 oz. in 1945 output increased to 4,441,000 oz. in 1950, at which level it has been approximately maintained. Last year's production of 4,379,000 oz. compares with 4,541,000 oz. in 1955 and 5,345,000 oz. in 1940. Nevertheless, the plight of the industry continues to give cause for serious concern.

According to figures published recently in *The Northern Miner*, about half of Canada's dwindling number of lode gold producers would be in dire straits almost at once if Emergency Gold Mining Assistance were discontinued or greatly reduced. A total of 43 lode producers received cost-aid last year. Eight did not qualify for assistance. Of the number qualifying, eight suffered a loss despite receipt of the subsidy. A further 14 would have been in the red but for cost-aid benefits.

No new gold mines made their appearance last year, apart from one producer, Chibougamau Explorers, which is essentially a gold-copper mine. On the other hand, four long-time producers have closed. All four had reached the point where further profitable production was impossible and further search for new ore was considered useless. Three of these companies have turned to other metals. The fact that none of them is looking for new gold properties is regarded as significant, because it is typical of the industry as a whole. Only three Canadian gold properties are under development and no new gold mill is being constructed.

Virtually no prospecting is being done for gold. If some prospector, in the field for other reasons, were to chance upon a gold discovery, he would probably not pass it by; but, as our contemporary points out, it would have to be one of high quality indeed to attract financing or development interests.

A disappointing factor last year was the failure of free selling privileges to become valuable. Since March 21, 1956, producers have been free to sell their gold wherever they desired, subject only to the Mint Custom Refining and Storing Regulations (1956). However, producers receiving aid under the provisions of the Emergency Gold Mining Assistance Act must sell their total output to the Royal Canadian Mint. The free market for gold bars has not been strong enough even to induce gold mines to give up cost-aid for the purpose of testing it, while the government refuses to mint gold coins, which do command a profitable price. However, a committee of the Canadian Metal Mining Association has been exploring the possibilities of promoting free market sales.

Though conditions for the gold mining industry continue to be bad, our contemporary reports that there is no atmosphere of pessimism or self-pity in the gold mining camps of Northern Ontario. Recognizing that the depressing factors are beyond their control, operators are tackling with considerable vim the problem of making operations profitable. Their attention is concentrated on studying and revising methods, not only in the mines but in the mills and other surface plants, increased efficiency being the aim throughout the plants.

The use of new machines has made the load on the individual miner considerably easier. There has been a constant endeavour to wring the last possible traces of values from the ore. Even after some 40-odd years of metallurgical experience, fresh changes are being made in flow sheets and processes in order to reduce maintenance and operating costs as well as to increase overall recovery of valuable elements.

The ultimate remedy, of course, lies in a more realistic price for gold, which cannot be indefinitely deferred. When gold ceases to be pegged at a level far below its true value, producers will continue to benefit from the greater efficiency achieved during the long years of adversity.

TRENDS FOR COPPER

In a report to the Council of the British Non-Ferrous Metals Federation, the retiring President, Mr. W. F. Brazener, J.P., said it would be a great pity if the cutbacks in copper production already announced by some producers resulted in a return to higher prices.

The two principal Rhodesian producers were now negotiating with their customers the details of a scheme which might ensure a uniform method of pricing Rhodesian copper; the first need of the industry was a stable copper price at a level sufficiently low to prevent serious and widespread substitution by aluminium, plastics, stainless steel and other materials. Both the copper producers and fabricators had a common interest in developing and expanding the market for copper products and it was en-

couraging to see that efforts were being made which might assist in bringing about a more stable price.

The main causes of the downward trend in copper prices had been a decline in the demand for copper products caused by a recession in such markets as the motor-car industry and the increase in unwrought copper production. World production of refined copper, which totalled 3,400,000 tons in 1954, rose to approximately 4,000,000 tons in 1956. There were two main causes for the increase, namely the comparative freedom from serious strikes in the latter year, and the coming into production of copper-mining projects which were initiated at the time of the Korean War.

The trend of trade during the past twelve months would appear likely to continue in the immediate future. There was little doubt, however, that overall demand for the industry's products would tend to increase steadily with the rise of new industries at home and with the increasing development of overseas industries. The proposals for a European Free Trade Area, raised issues of great importance, and might result in considerable changes in the general pattern of industry in the United Kingdom over the next two decades.

The speaker added that the general expansion of the industry would be governed, to no small extent, by the availability and price of metal supplies. Although the London Metal Exchange had not yet succeeded in regaining the degree of importance which it commanded before the war in setting the world price of copper, this had been due largely to the small amount of copper available for sale on the open market, over and above consumers' normal requirements. Sudden increases in demand and "panic buying", even on a relatively small scale, had been sufficient to cause wide day-to-day fluctuations of prices, annoying to the industry's customers and damaging to its prospects. There were indications that these conditions may be passing with the increased production of copper and that its price may be moving towards increased stability through the natural action of supply and demand and through co-operation among leading producers.

IRON IN VENEZUELA

Puerto Ordaz and Ciudad Pier, new names on the Venezuelan map, have been created as a result of the expenditure of about $500,000 in the development of an iron deposit believed to exceed the Mesabi Range in potential wealth. The Orinoco Mining Company, a subsidiary of the United States Steel Corporation, in order to be able to market this huge output, constructed a 90-mile railroad, an asphalt highway of about the same length, two docks at Puerto Ordaz which were towed from Texas, dredged 154 miles of the Orinoco River between Puerto Ordaz and the Caribbean, and constructed the two small cities, complete with homes, hospitals, schools, water supply and all other requirements.

This huge deposit is at Cerro Bolivar, a ridge about one mile wide, four miles long and 1,600 ft. above the plain, familiarly known as "Iron Mountain". According to the Mining and Metallurgical Society of America, proved reserves are said to be 500,000,000 tons, assaying 63 per cent. Iron is the basic metallic element sought and being exploited but it is reported that extremely rich values in diamonds, gold, bauxite, vanadium, manganese, nickel, asbestos and natural gas have been found. A 300,000 kw. hydro-electric power plant and a steel mill with a potential capacity of 421,500 tons a year, are being constructed. Exports have reached 8,300,000 tons a year and it is expected that this rate can be maintained indefinitely. About 80 per cent of the exports go to the United States.

In addition about 3,000,000 tons were exported last year by Iron Mines of Venezuela, a subsidiary of the Bethlehem Steel Corporation, which has been operating for several years at El Pao, about 20 miles from Puerto Ordaz.

Following these developments and due to the sharp increase in the demand for steel in Venezuela, which has now reached 600,000 tons a year, the Venezuelan Government is establishing a steel mill about four miles west of Puerto Ordaz which will obtain its power from the hydro-electric plant at Caroni Falls.

PAKISTAN'S SEARCH FOR MINERALS

The West Pakistan Government is setting up a Rs.10,000,000 Mineral Development Corporation for the exploitation of mineral deposits in the North-West Frontier regions. Dr. I. H. Usmani, Director of Industries, West Pakistan, said that the Corporation would sponsor and float private companies for the exploitation of minerals which are known to exist in the area. Intensive commercial surveys will be made of known deposits, which require heavy investment of capital. The known mineral deposits in these areas include asbestos, soapstone, calcium, marble, iron ore, copper and chromium.

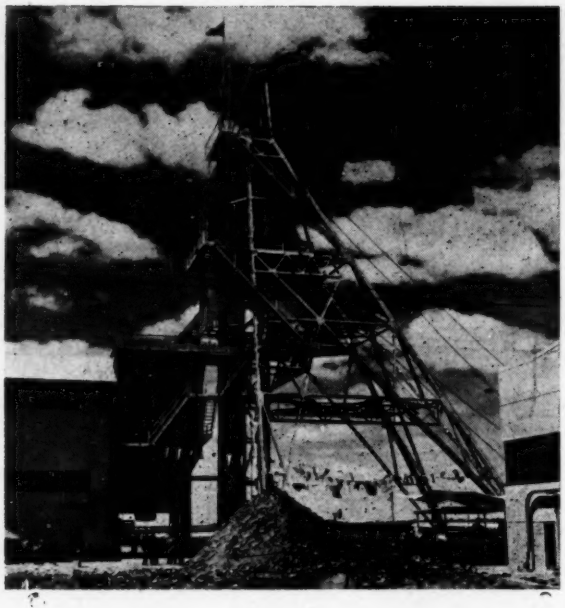
The Atomic Energy Commission of Pakistan has launched the second round of its search for radioactive minerals in Pakistan. Selected teams with the necessary scientific background have been sent to cover Baluchistan and the North-West Frontier areas to look for radioactive minerals.

Meanwhile, plans are being made for starting atomic research in the country. Negotiations with the United States of America have been going on for some time for the installation of a reactor. More scientists will be sent abroad from Pakistan this year for advanced training in nuclear physics and allied subjects.

U.S. COAL FORECASTS

Overseas shipments of U.S. coal currently running at the rate of 61,000,000 s.tons per year are expected to at least equal and possibly exceed last year's record figure of 51,000,000 tons. Long-term forecasts put the annual export tonnage at 90,000,000 by 1975 with a total mine output of 1,000,000,000 tons. Much of the anticipated demand will come from the electric utilities which are expected to be using 600,000,000 tons per year by 1975 compared to 155,000,000 tons in 1956. There is a trend at the moment away from gas- and oil-fired electric generators which if continued will greatly increase demand for small coal over the next decade.

This diverting of small coal to boiler plant is also concerning the U.K. and the National Coal Board may soon ask the government to revoke the ten-year contracts entered into with the oil companies for the supply of fuel oil for dual-firing power stations. When these contracts were first placed in 1955 the N.C.B. had little likelihood of being able to supply the extra 10,000,000 tons of small coal a year by 1960 which the Central Electricity Authority required. Now, however, the N.C.B. faces the prospect of a growing surplus of small coal for which the C.E.A. provides the obvious market. Despite the building up of a surplus of small coal there is still a deficiency of large coal for domestic fires and as a result the U.K. is to continue to import such coal at the present rate of 4,000,000 to 5,000,000 tons a year.



Progress at Radium Hill

URANIUM may mean even greater wealth for Australia than the fabulous gold discoveries of just over a century ago—because the wealth will be in power and water for a continent short of both.

Radium Hill, the first phase of South Australian uranium development to reach maturity, is the centre of extensive deposits. Just how extensive these deposits are, only continued exploratory drilling will show conclusively. The product of a £A6,750,000 capital outlay, Radium Hill shows that in size and grade of the lodes it matches fields being economically exploited in other countries.

In developing Radium Hill, the South Australian Government was spurred on by a technical report of the United States Atomic Energy Commission advising that Radium Hill was destined to be an important world source of uranium and should be developed with all speed. The mine began production on November 10, 1954, and a few months later a full-scale extraction plant was operating at Port Pirie. To-day, output of uranium oxide—the latest stage reached in the Australian production chain—is running at approximately 450,000 lb. p.a. The output is exported.

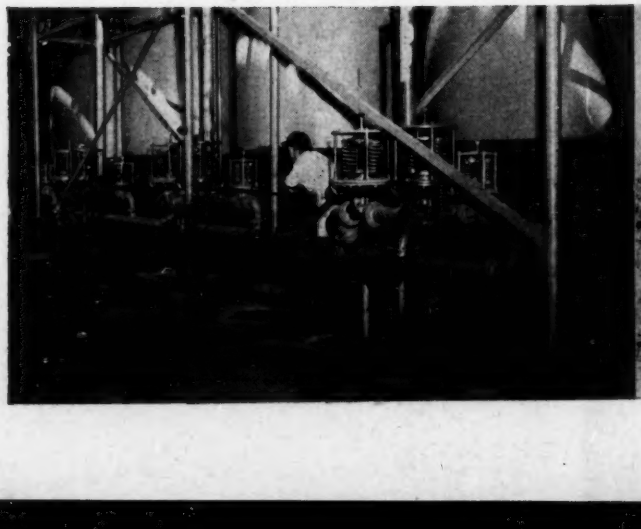
The purchaser is the Combined Development Agency of the United States and the United Kingdom, which advanced part of the capital for the establishment of the industry. The Agency will continue to take the entire production until 1962 when its agreement with the South Australian Government runs out.

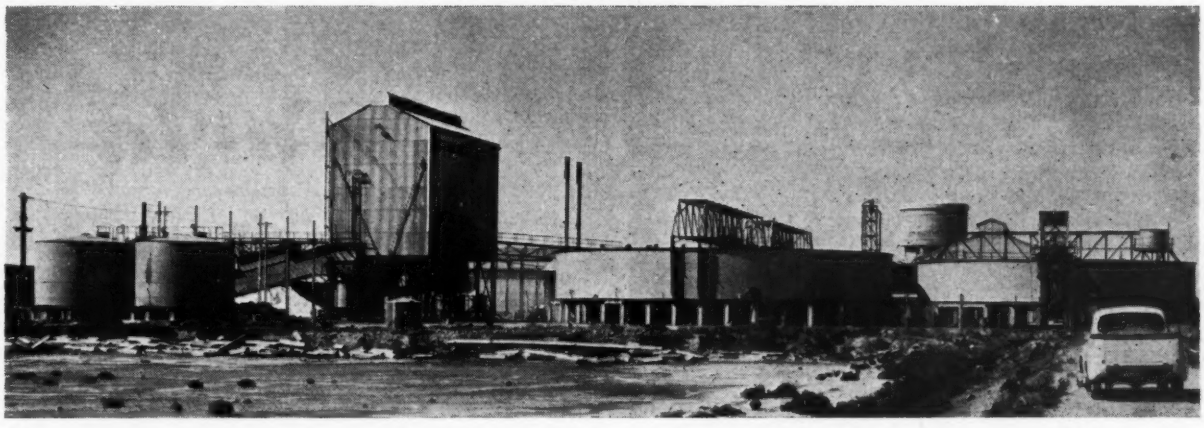
The Ultimate Goal

Lacking oil and adequate coal resources, South Australia sees the succcessful development of a lucrative uranium industry as a stride towards its ultimate goal—the erection of a nuclear energy station using South Australian uranium. Local atomic energy authorities regard South Australia as one of the regions in Australia where economics favour the establishment of a nuclear power station, and the distinguished Australian physicist, Professor Marcus Oliphant, envisages the ultimate establishment of nuclear power stations on Spencer Gulf, not only for the generation of electricity, but also to distil sea water and pump it inland to bring arid areas to life.

By the time the agreement with the Combined Agency expires the South Australian Government will have a debt-free uranium industry ready to support its first thermal nuclear station. It is deferring action until the design of

Above, the headframe of the Main Shaft at Radium Hill. Below left, the ion-exchange section of the Port Pirie extraction plant. Below right, the crushing and refining plant at Radium Hill





Above is the South Australian Mines Department uranium treatment plant at Port Pirie. The plant is built on reclaimed tidal swampland. Below, loading uranium ore into skips at the 700 ft. level of the Radium Hill mine

nuclear reactors reaches a more advanced stage, but expects to begin its installation in four or five years. In preparation for that day the government is sending technical staff to British atomic energy establishments for training.

Sufficient reserves of ore exist at Radium Hill to meet future estimated local needs. The ore, a coarse aggregate that includes davidite, ilmenite, rutile, magnetite, haematite, pyrite and chalcopyrite, with quartz and biotite, is described as medium grade. Up to 9 per cent of uranium oxide is found in davidite.

Other major uranium deposits in Australia, chiefly Rum Jungle in Northern Territory and Mary Kathleen, near Mount Isa in far western Queensland, can be exploited by open-cut mining. At Radium Hill the bulk of the ore is in three main veins dipping at angles of 30 to 70 deg. and averaging 4 ft. in width, and it has to be mined by conventional hard rock underground mining methods.

The mine has gained an impressive reputation in the mining industry as one of the most efficient in Australia. The main shaft has been taken down to 850 ft. It is being continued to 1,300 ft. and even then the deepest limits of the known veins will not have been proved. From the main shaft, drives have been developed at seven working levels to intersect and exploit the three lodes.

Mining and Treatment

Most of the miners engaged at Radium Hill work on a contract basis, winning an average of 20 tons each shift with some doubling that figure. Earnings average £7 a shift and rise to £10. Due to the irregularity of the lodes, the mine geologist makes a regular inspection of all working faces, testing with a geiger counter to guide the miners. Ore is hauled up the main shaft to the headworks and tipped into bins. It is fed from these into a jaw crusher to begin the series of production processes that ends 202 miles away at Port Pirie. The Radium Hill stage of the treatment process is designed to take out a high percentage of waste ore and so reduce the bulk to be carried to Port Pirie. Without this preliminary minehead concentration, the whole project would have been uneconomic and the Radium Hill field would have been abandoned. As a result of the Radium Hill ore dressing technique, the concentrate finally railed out has a relatively high uranium content compared with that of most other uranium ores.

Techniques used are similar to those employed in base metal concentration plants with modifications to suit the special characteristics of the ore. It is said to be the only plant of its kind using the heavy-media system—a steel alloy sludge treatment—for the recovery of uranium ore.

Port Pirie was selected as the site for the uranium oxide extraction plant because the existing railway from Broken Hill to Port Pirie passed within 11 miles of Radium Hill and provided a handy link with the nearest port. Acid, salt and water supplies were also readily available there.

The £1,500,000 plant has been in production since 1955. It operates continuously seven days a week but the Radium Hill output of concentrate does not take up its full capacity. It will be able to absorb the ore from Crocker's Well also if it is decided to go ahead with the opening up of that field.

Extraction methods are common to the treatment of uranium ores throughout the world. The davidite mineral containing the uranium in the Radium Hill concentrate, however, is highly refractory, and resistant to ordinary leaching or dissolution treatments. It is necessary to treat it for ten hours with sulphuric acid at boiling point to free the uranium.

After separation and purification the moist yellow uranium oxide powder travels on a stainless steel belt through a dryer in a temperature of 500 deg. F. It is then discharged into 500-lb. drums ready for shipment.

World Coal

A WORLD record output of 20,800 tons in one week from a deep site was achieved in late June by Costain Mining Ltd. at their Acorn Bank (Northumberland) opencast coal site. The total excavation is equal to that required to construct the Panama Canal, and the site will yield 5,500,000 tons of coal in seven years. The highest day's output of 4,016 tons was reached on June 20.

Large-scale strip mining operations undertaken at Acorn Bank by Costain have aroused the interest of mining engineers in many parts of the world. Visitors to the site have come from over 20 different countries, including Russia.

The Acorn Bank Project

The Acorn Bank opencast coal contract was let to Costain Mining Ltd. by the National Coal Board (Opencast Executive) in 1955. Interest in the project quickened with the opening of the initial box cut—the largest man-made hole in Europe—in June, 1956, the formation of which necessitated the removal of nearly 10,000,000 cu. yds. of overburden. Other developments which followed were the building of a two-mile private road from site to screening plant, and the commissioning of a fleet of four coal haulers with eight 40-ton bottom dumping trailers.

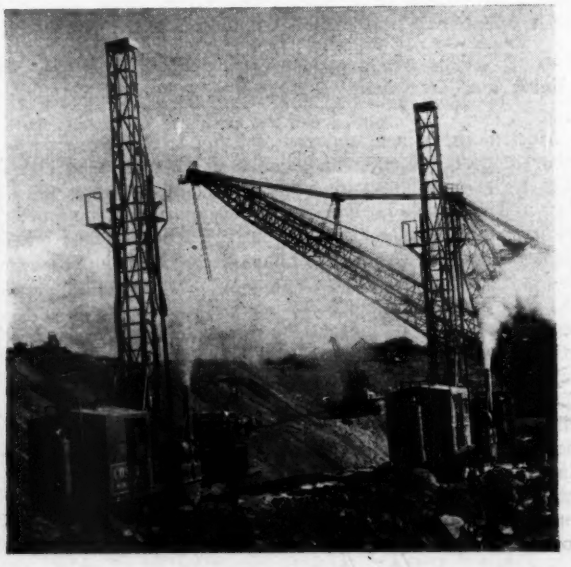
In June, 1957, the site moved into its period of peak production and this will be be maintained until the bulk of the coal has been removed. In the spring of 1957 four high-speed derrick cranes were installed to hoist the skips containing 10 tons of coal each and tip them into the haulers, and the site now has one of the heaviest—if not the heaviest—concentrations of earth-moving equipment in Europe.

Plant engaged on the removal of overburden includes two 1150-B 25-yd. draglines manufactured by Bucyrus-Erie; three 5-yd. electric shovels by Ruston-Bucyrus and a fleet of 22-ton Euclid rear dump trucks, and a number of 2-yd. and 1-yd. shovels manufactured by Ruston-Bucyrus, Newton Chambers and the Lima Corporation are employed on coal excavation. The four 13-ton electric derricks used for hoisting the coal were designed and manufactured by Butters Bros, and can operate with either 10-ton capacity skips or 5-ton grabs.

Auxiliary plant includes both Caterpillar D-8 and Vickers VR-180 dozers and scrapers, and a Caterpillar 955 Traxcavator fitted with hydraulic back ripper is being successfully used to remove the hard bands of shale occurring among the coal. A recent innovation is horizontal drilling by 24-in. augers at the southern limit of the site and to date some 500 tons of coal have been recovered by this method.

The general method of working the site planned at the beginning of the job has been followed. Along the eastern boundary an initial box cut 3,200 ft. long, 100 ft. wide and 230 ft. deep was formed in mid-1956. Parallel cuts 80 ft. wide and running in a north-south direction are to be made progressively towards the west and the number of similar cuts necessary before the site is worked out will be about 65. In June, 1957, the eighth cut was being worked. After removal of 12 in. of topsoil and 3 ft. of subsoil, which are stored on the site, 5 cu. yd. electric shovels are used for reduction of overburden down to about 140 ft. above the bottom coal.

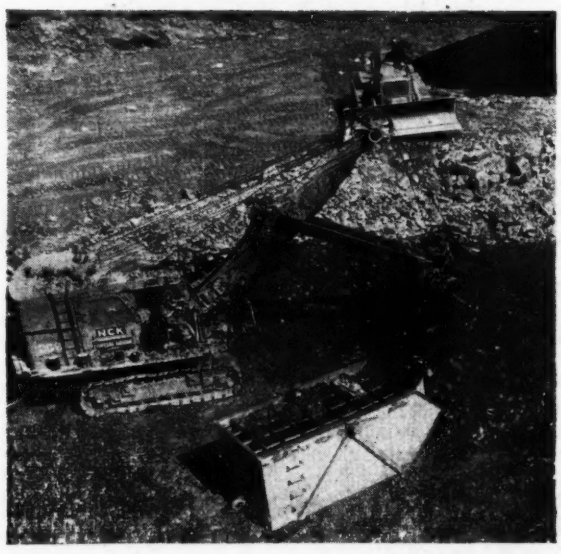
Working on the high wall highway thus formed are the two 1150-B draglines, four electric derricks and rotary air-blast drills, in addition to the coal hauling equipment. The draglines, working one at either end of the cut, remove the overburden down to the coal seams and deposit the spoil in the previous cut, from which the coal has been removed.



Above: One of the 1150-B 25-yd. Bucyrus-Erie draglines exposing coal at the north end of the cut and casting the overburden into the previous cut. The exposed coal is being loaded by Butters' derrick and 5-ton grab into 40-ton coal hauler

Opposite: Two Joy-Sullivan drills preparing the ground for dragline operation

Mining Record



In the early stages of this work some 6,000,000 cu. yds. was removed by Euclid dump trucks to an old site at Ewart Hill, one mile distant, in addition to nearly 4,000,000 cu. yds. which is lying in dumps around the site to await replacement in the final void.

Work at Acorn Bank goes on throughout the whole week, night and day. The draglines work three 8-hr. shifts each day and the rest of the site work is in two 12-hr. shifts, each shift being in charge of a works superintendent. Coaling is carried out during hours of daylight.

For hoisting the 10-ton loaded skips from the cut and tipping into the coal haulers, or the alternative method which is by a 5-ton grab, four electric derrick cranes are used. Each crane is mounted on three bogies at 60-ft. centres which are fitted with four large diameter single-flanged rail wheels set for 5 ft. 6 in. rail gauge. The two end bogies carry 60-tons ballast.

Right: Cat 955 fitted with hydraulic back ripper removes hard shale bands from coal seams. A 5-yd. Ruston-Bucyrus shovel is in the immediate rear with a Bucyrus-Erie dragline on the far bench. 10-ton skip is descending

Above: An N.C.K. 2 cu. yd. shovel loading a skip in the cut. The skip holds 10 tons

To enable the direction of travel to be altered through 90 deg., four 25-ton hydraulic jacks are fitted to each bogie.

Horizontal augering for coal is something quite new on an opencast site in this country. At Acorn Bank in recent months a Joy coal auger has been in use for experimental drilling into the seams at the northern and southern limits of the site to recover extra coal beyond the area being worked by the method adopted for the site generally. The total amount of coal recovered so far is around 500 tons. The auger is electrically powered, with a supply of 500 v., 3-phase, 50 cycles.

It is mounted on a steel frame with small diameter single-flanged steel wheels set for a 3ft. 6 in. rail gauge. Four hydraulic jacks are fitted one to each corner for levelling up the machine. A barrel-type cutting head fitted with 18 tungsten carbide-tipped bits and having a pilot drill with eight finger bits set in the centre of the barrel head is used. The outside diameter of the cutting head is 30 in. and the length of auger flights 48 in. Horizontal holes are drilled to a depth of 60 ft. at approximately 3 ft. centres and two drilling heads are available, enabling flights to be stored in the completed hole and extracted for use by means of a winch fitted to the machine. The penetration rate averages 1 ft. p.m. and each completed hole yields approximately 12 tons. The coal falls on to a small mobile conveyor and is loaded into road wagons. The next stage is to increase the depth of each hole and thus step up the output per hole.

Ancillary Operations

Costain in 1956 built a 1¼-mile long private road with a 30 ft. carriage-way direct from Acorn Bank to the screens at Bebside. Among the considerations which led to this project being planned were that loads over the public highway, which are limited to 14 tons, were too small to allow long-term economic loading and hauling; and the danger to the public because of the presence of sharp bends and steep gradients. There are three fly-over bridges crossing two main roads and the river Blyth; 50,000 cu. yds. was excavated in cutting through a hillside and 100,000 cu. yds. of sandstone and poststone used for making the road.

Interesting statistics show that an average of 540,000 tons of overburden and 16,000 tons of coal are removed each week. Production per man-shift is 6.2 tons. The total dig during the contract will be 120,000,000 cu. yds. Some 720,000 tons of coal have been produced to date.

SULPHUR AND ITS PRODUCTION

SINCE the year 1900 world consumption of sulphur has risen from 575,000 l. tons, of which only 3,000 tons were produced in the U.S., to about 13,500,000 tons in 1955 (excluding the U.S.S.R. and satellite countries), of which more than half was produced in the U.S.

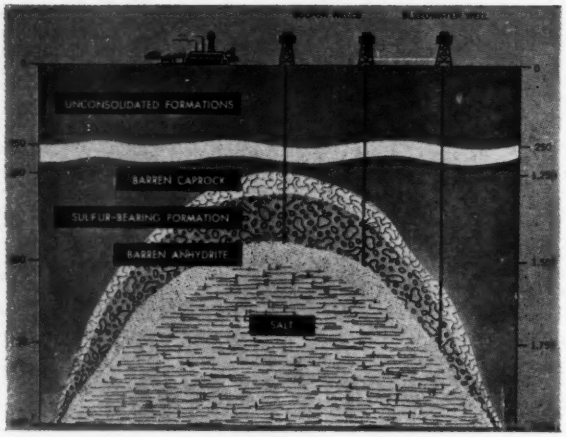
The Stauffer Chemical Co., which set up its first sulphur refining plant in San Francisco about 1885, claims to be the world's largest purchaser and producer of crude sulphur. Its latest publication, *Stauffer Sulphurs*, contains a wealth of information about a material without which Western civilization could not exist.

Sulphur contributes to the growth of every crop, and therefore to all animal life. It has a part in the casting of light metals and in the production of fine copper. It is estimated that 35 lb. of sulphur are required in the manufacture of every motor car. Sulphur purifies sugar and starch. In the manufacture of viscose rayon it plays a four-fold part : it is the active agent in preparation of the wood pulp, as carbon disulphide it reacts to form the xanthate, as an acid it fixes the threads, and as an ingredient of sulphur dyes it makes the colours. Without sulphur and its beneficial effect on rubber, there would be no useful rubber, either natural or synthetic, and likewise no petrol to propel motor cars. Eighty-eight of the 150 most important chemicals used in industry require sulphur in their manufacture. More than three-quarters of the sulphur output is used in the production of sulphuric acid with its innumerable uses.

The volume of sulphur consumed in the U.S. is estimated at 73 lb. annually for every resident of the country, and the number of uses is constantly increasing.

Sulphur occurs as mineral deposits in the free or elemental state, and in the combined state as sulphides and sulphates. The most abundant sulphides are pyrite (FeS_2), chalcocite (Cu_2S), chalcopyrite ($CuFeS_2$), sphalerite (ZnS), galena (PbS), and bornite (Cu_5FeS_4). The correspondingly abundant sulphates are gypsum ($CaSO_4.2H_2O$) and the accompanying anhydrite ($CaSO_4$), kieserite ($MgSO_4.H_2O$) and anglesite ($PbSO_4$). Huge deposits of sulphides, especially pyrite, exist several thousand feet beneath the earth's surface.

Elemental and combined sulphurs are also found in coal, petroleum, and many mineral waters. A significant source of sulphur during recent years is that present as hydrogen sulphide in natural " sour " gas. A huge potential supply is the approximately 11,000,000,000,000,000 tons present as sulphates in the oceans' waters.

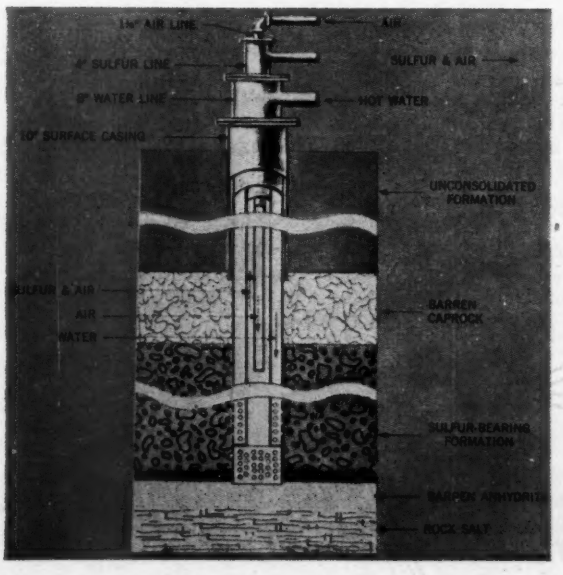


Schematic cross section of typical salt dome deposit on the Gulf coast of the American continent

The elemental form, referred to as native sulphur, is of the highest importance because of its accessibility, and of its natural high purity which facilitates refining. Basically there are two types of native sulphur deposits, which are distinguished by the geological formations in which they are found.

In regions of past or current volcanic activity huge deposits of sulphur occur in and about the volcanic vents, which expel volumes of hot gases containing hydrogen sulphide and sulphur dioxide. The greatest accumulations of this type are found in Japan, Chile, Mexico, Iceland, Norway, Spain and in the Rocky Mountain region of North America. Muds of crater lakes and encrustations about fumaroles also contain solfataric sulphur in great quantities. Volcanic vents which are no longer active are characteristically surrounded by deposits of sulphur. Many mineral springs have muds which contain solfataric sulphur. They are believed to be connected, through faults in the earth's crust, with extinct or active volcanos at great distances beneath the earth's surface.

Schematic cross section of typical Frasch process installation



Free sulphur which accompanies gypsum and anhydrite accumulations is by far the more important of the two types of native sulphur deposits. At present 95 per cent of the world supply of sulphur is derived from these sources. The major deposits of gypsum-type native sulphur occur on the Gulf coast of Texas and in Louisiana and Mexico. The sulphur occurs at depth of 500 to 3,000 ft. in "domes" subterraneously upthrust by underlying columns of salt. Ranking second to the U.S. in productivity is the enormous deposit in south central Sicily, which extends over 1,000 miles from Mount Etna in the east to Girgenti on the west, embracing an area of 1,600 sq. miles.

Production Methods

It may be said that sulphur is produced by more methods than any other of the common metals or elements. It is dug from the ground as coal is mined ; it is captured as a waste gas in the refining of metals ; it is condensed from natural or refinery gases evolved in petroleum refining ; and it is melted in the ground and brought up like a gusher.

American sulphur had its origin in the search for petroleum. The presence of oil was detected about 1869 in Calcasieu Parish in Louisiana. Borings were made and studied by a trained geologist, who discouraged the plan to seek oil at this point but strongly recommended an effort to mine for sulphur. Numerous abortive attempts were made to sink mines by conventional methods. Success was gained by the novel method of melting the sulphur in the ground and forcing it out as a liquid. This was the plan of Dr. Herman Frasch, a brilliant and energetic petroleum scientist.

Briefly, the Frasch process consists of sinking a steel tube to the bottom of the sulphur-bearing limestone. The tube is perforated to emit superheated water at the level of the sulphur vein and to admit melted sulphur at the bottom. Within this tube is a smaller tube through which the melted sulphur rises. Inside the latter is a still smaller tube carrying compressed air.

In practice, superheated water pumped down under great pressure at about 330 deg. F. melts the sulphur, which flows down through the surrounding rock to form a pool around the bottom of the larger pipe. It enters the pipe through the holes prepared for the purpose and rises some distance in the pipe because of the water pressure in the rock formation above. Air pressure from the innermost pipe forces it the rest of the way to the surface as an emulsion of air and sulphur. At the surface the molten stream is deaerated and sprayed into huge vats, where it cools and solidifies.

The U.S. is adding to its sulphur resources by stripping hydrogen sulphide from natural "sour" gas, petroleum refinery gas, water gas and other fuel gases. Pyritic refining and other methods are also employed. Indeed, aside from the primary source of salt-dome sulphur, there are 70 or more sulphur-producing operations in the U.S. making a substantial contribution to supplies. Of 6,900,000 tons of sulphur produced in the U.S. in 1955, 5,700,000 tons came from the Frasch process, 390,000 tons from natural "sour" gas or petroleum refinery gas, 400,000 tons from pyrites, and 410,000 tons from other sources.

In Sicily sulphur is found in sedimentary beds of calcite, gypsum, bitumen and celestite. The ore is mined by hand or mechanical shovels and refined in Calcarone or Gill furnaces, the latter, which are of superior efficiency, being now in general use.

The historic Calcarone furnace is a masonry structure, often 100 ft. in diameter and 35 ft. high, which is usually located on a hillside to provide gravity flow of refined sulphur through a tap hole at the lowest point. Waste ore is spread over the floor and fresh ore charged to the full depth. The charge is ignited about 12 ft. from the floor. Almost a third of the sulphur burns, providing heat to melt the remainder, which trickles through the ore bed, out of the tap hole, and into wooden moulds.

The Gill furnace consists of two to six cylindrical chambers capped with a single dome and interconnected by ducts which convey the hot gases of combustion from one chamber to the next. This heat exchange system prevents overheating one chamber while it preheats the next in the series to a point at which spontaneous ignition occurs when additional air is admitted. Melting capacity and recovery are higher than in the old method.

In Norway there is some solfataric sulphur, but much of the production comes from pyritic copper ore by the Orkla process as a by-product of copper smelting. The ore, with coke and flux, is heated to 1,400 deg. F. The waste gases contain carbon dioxide, carbon oxy-sulphide, carbon di-sulphide, hydrogen sulphide and sulphur dioxide.

During recent years geological surveys have revealed salt-dome deposits in the Isthmus of Tehuantepec, Mexico, resembling those further north on the Gulf coast. These — adapted to the Frasch process — are becoming sulphur sources of substantial importance. It is anticipated that this year Mexico will produce more than 1,000,000 tonnes of sulphur, most of the output being scheduled for export.

Canada has also become a leading producer of sulphur. From 551,071 tons in 1954 output has risen to 763,736 tons last year. By far the largest source of Canadian sulphur is pyrite, obtained as a by-product from the treatment of base metal sulphide ores. Canada's largest producer of pyrite is Noranda Mines.

Deposits of natural sulphur in Poland are to be exploited under an agreement with Czechoslovakia, which provides for credits to be paid for by sulphur deliveries. It is expected that in 1961 an output of about 100,000 tons of pure sulphur will be obtained.

Refining Processes

The many refined sulphurs on the market are made from crude sulphur which, in the case of Stauffer, is drawn from the salt-dome deposits of the Texas and Louisiana Gulf coast and from hydrogen sulphide found in natural "sour" gas. Crude sulphur, when stockpiled from its source in the Gulf coast salt domes, is already 99.5 per cent pure. Refining for the market consists chiefly in adapting it to the particular needs of a great variety of industries and of individual users. Three basic refining processes are employed. All are preceded by a pre-refining operation in which the so-called crude sulphur is melted, then purged by coagulation of most of the impurities which remain in it.

In the condensation refining process, pre-refined sulphur is melted, converted to vapour, and condensed to a liquid again. The reliquefied sulphur is cascaded through a series of kettles which trap remaining impurities. It is then cast for delivery.

In the sublimation process the pre-refined liquid sulphur is vapourized and precipitated on cooled surfaces as a solid without passing through the liquid phase. This produces a fluffy powder known as flowers of sulphur or sulphur sublimatum, which has a purity above 99.8 per cent and contains approximately 30 per cent of the amorphous μ allotrope.

A super-sublimation process, claimed to be unique, is used by Stauffer to produce a fluffy powder of extremely bright yellow colour, containing a minimum of 85 per cent of the amorphous allotrope of sulphur, which is completely insoluble. This allotrope is a theroplastic high polymer with a molecular weight between 100,000 and 300,000. In physical properties it resembles thermoplastics and elastomers.

MINING MISCELLANY

Three more U.S. companies are to begin prospecting in South-east Turkey.

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The World Bank is sending a mission to Thailand, at the request of the Government, to assist in the formulation of a long-term development programme.

★

A plan to improve industrial safety regulations, especially in mines, is to be discussed by the parliamentary assembly of the six-nation European Coal and Steel Pool when it meets in Rome in November.

★

Pakistan's Geological Survey will receive roughly 1,000,000 rupees in aid from the International Co-operation Administration during the 12 months beginning on July 1 this year. The I.C.A. aid will include a programme for training Pakistani geologists in Karachi.

★

Mexican Gulf Sulphur Co. has abandoned further exploration efforts on the Nopolapa concession in Mexico. About 30 wells were drilled on the site, none of which contained commercial quantities of sulphur, though some showed traces.

★

An aerial survey of 6,000 sq. miles of Southern Rhodesia is to be undertaken by the U.K. Atomic Energy Authority in search of radioactive minerals. Maps of radioactive areas will be published periodically.

★

Mr. John Profumo, Under-Secretary at the Colonial Office, stated in the Commons that no decisions have yet been reached by the U.K. and Sierra Leone Governments, following discussions between the two governments and Columbia-Southern Chemicals Co. and British Titan Products, Ltd., on the development of Sierra Leone's rutile deposits.

★

The Eire Minister of Industry and Commerce, Mr. Lemass, has stated in Parliament that operations at the copper mines in Avoca, County Wicklow, are going according to plan. There have been no indications of difficulties by the company concerned. The Minister denied that the fall in world prices of base metals was having any discernible effect on the operations of mining interests in Eire.

★

French banking and mining interests have formed a company with a capital of Frs.5,000,000 to develop the economy of French Equatorial Africa and, in particular, the French Congo. Known as *Société pour le developement du Congo Francais*, the new company will promote investments in this part of French Africa with a view to the establishment of mining and industrial undertakings.

★

Work at the Senkora gold mines in Tibet, which until recently were exploited by private owners, on payment of a royalty to the Dalai Lama, is reported to have been stopped by the Chinese Government, allegedly because mining methods were "wasteful and unscientific". Chinese mining experts are believed to be conducting a survey of gold deposits and of the areas around the goldfield. The Tibetan gold ore is considered to be of high grade.

★

Sematan Bauxite, Ltd., will shortly start mining deposits of good-grade bauxite in western Sarawak. The mine is situated in the Sematan area of the Leneu district, and will be open-cast. Shipping operations are expected to begin next April with an initial production of 500 tons daily. The deposits were found by Sarawak Government geologists in 1949, and were later prospected by the British Aluminium Co. Proved ore amounts to 2,000,000-2,500,000 tons, and there are other small deposits nearby.

★

Intensive work is proceeding in Poland and East Germany to start the construction of a huge open-cast brown-coal colliery at Turoszow in Lower Silesia. Deposits at Turoszow are estimated at some 1,000,000,000 tons. It is expected that in 1965 the two open-cast collieries will yield over 25,000,000 tons of brown coal.

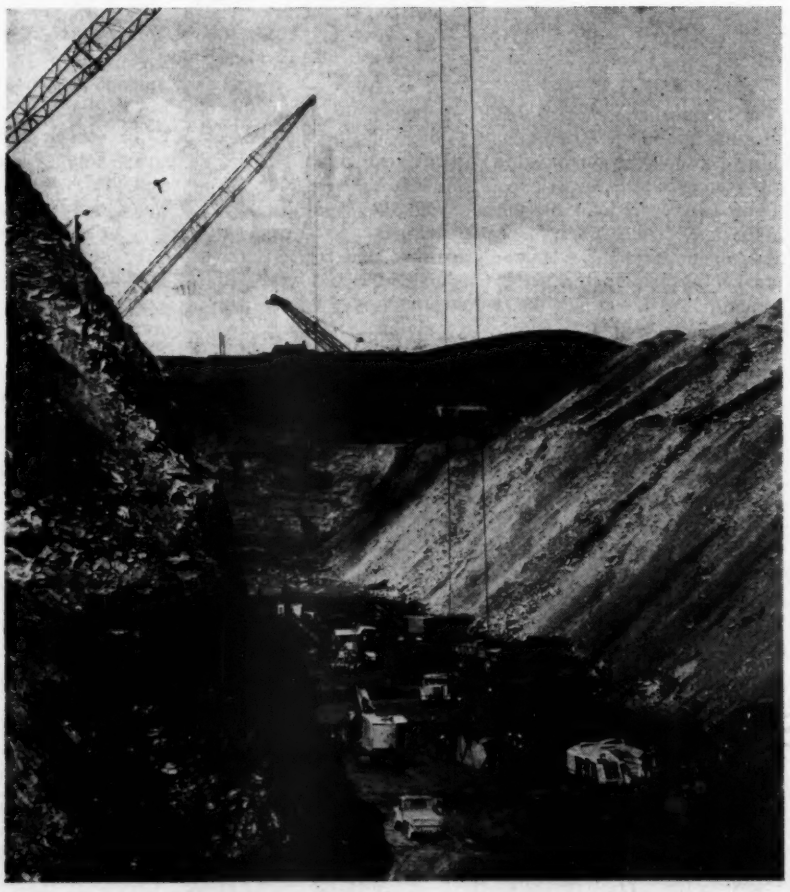
★

The Spanish Council of Ministers has authorized the setting up of a zinc undertaking under the name of Asturiana de Zinc S.A. The Brussels-based Compagnie Asturienne des Mines, operating in Spain under the name of Real Compania Asturiana de Minas, is participating in the new concern to the extent of 40 per cent. In normal conditions, foreign participation in newly formed companies is limited to 25 per cent by law. Furthermore, the *Official Bulletin* last year published a decision of the Ministry of Industry, under which no foreign participation is permitted in the Spanish zinc mines or zinc smelters.

★

The iron ore resources of the magnetic anomaly recently discovered near the city

Panoramic view of the Acorn Bank open-cast coal site in Northumberland. The mining operations of Costain Mining Ltd. at this project are described on a previous page of this issue. The illustration is a general view of coaling operations at the north end of the cut. The heavy concentration of equipment shows Bucyrus-Erie 1150-B 25-yd. dragline, 22-ton Euclid rear dump trucks, Caterpillar 955 Traxcavator, Ruston Bucyrus, N.C.K. (Newton Chambers) and Lima shovels, and high-speed Butters' derricks equipped with 10-ton grabs



The first helicopter ever to be seen in Northern Rhodesia was recently taken to the territory by Autair Ltd., and is on charter to Rhodesian Selection Trust Services Ltd. The machine, a Bell 47 G.2, is being used in prospecting operations. The survey commenced towards the end of April and at the moment operations are being conducted from a base camp near the Solwezi-Chingola Road

of Kremenchug, in the Ukraine, are estimated at 700,000,000 tons. The development of the anomaly will begin with the working of the Galeshchinsky and Verkhne Plavninsky deposits. The ore there can be mined both by underground and open-cast methods. It is planned to erect an ore-dressing factory for the treatment of Verkhne Plavninsky magnetites. The factory will handle many millions of tons of ore and produce more than 5,000,000 tons of concentrates a year. The ores of the Galeshchinsky deposit have an iron content of more than 60 per cent.

★

With the intention of ensuring better conservation and exploitation of the country's mineral wealth, the Government of India is understood to have decided to fix a ceiling on the area for which prospecting licences in respect of any mineral or any prescribed group of minerals can be granted to private parties. This ceiling is likely to be 50 square miles. At present there is no maximum limit prescribed for the grant of prospecting licences. A bill embodying the ceiling will be brought before Parliament. The Central Government also proposes to assume powers to reduce or expand the maximum area of 10 square miles which at present can be held on a mining lease, if the step is finally found advisable in the interest of the mineral development of any State.

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The National Coal Board has decided to institute a special qualification for candidates appointed in the future as superintendents, assistant superintendents, station officers and assistant station officers of Central Rescue Stations. This special qualification will be introduced from January 1, 1959. The Institution of Mining Engineers has agreed to conduct the examinations for this qualification and to issue certificates. The National Coal Board will make the necessary arrangements for the preparation of candidates for the examination, which will be first held in 1957 and thereafter at such times as may be required. It will consist of a paper on mining practice and a paper on rescue, together with a combined oral examination and practical test. Specimen question papers can be obtained from the secretary, the Institution of Mining Engineers, 3 Grosvenor Crescent, London, S.W.1.

PERSONAL

The Marquess of Salisbury has been appointed a director of the British South Africa Co.

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Capt. Charles Waterhouse, M.P., has been appointed a director of Tanganyika Concessions, Ltd., with effect from July 31, in place of Mr. Arthur Crichton, who will retire from the board on that date. Mr. Crichton has been appointed a member of the advisory committee. Capt. Waterhouse is to become chairman of the company on September 24 in succession to Sir Ulick Alexander, who is resigning this position for health reasons, but will remain on the board.

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Sir Ulick Alexander has accepted an invitation to join the boards of the Zambesia Exploring Co. Ltd. and its subsidiary, the Zambesia Investment Co. Ltd.

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Mr. W. M. Warren has been re-elected chairman of the council of the Malayan Chamber of Mines, and Mr. E. D. Shearn vice-chairman.

★

Mr. Clifford Waite has been elected a director of the Chartered Bank.

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Mr. F. Buckland has been appointed secretary and office manager of United Coke and Chemicals Co. and of the ore mining branch of the United Steel Co.'s.

AGENCY WANTED

Theodor Kiepe K.G., Dusseldorf-Reisholz, Am Koehnen 4, wish to contact U.K. manufacturers of electrical and other equipment used by mining companies, municipal transport services, etc. They are primarily interested in manufacture under licence, but are also willing to consider an agency proposition. B.O.T. Ref.: ESB.15376/57. Telephone enquiries to Chancery 4411, extension 776 or 866.

CONTRACTS AND TENDERS

Formosa

TEN./26629. An International Co-operation Administration (I.C.A.) procurement for Formosa calls for two mine locomotives powered by 4-cycle diesel engine and two mine locomotives powered by air motor of not less than 7½ rated h.p. Project Implementation Order No. 84-21-007-9-70248 (Invitation No. US-236-D). Bids should be sent to Central Trust of China Purchasing Department, 68 Yen Ping Nan Road, Taipei, Taiwan (Formosa). Closing date 24/7/57. B.O.T. Ref.: ESB/15889/57/I.C.A. Telephone enquiries to Chancery 4411, extension 360.

Formosa

TEN.26718. The International Co-operation Administration (I.C.A.) have announced a procurement comprising various items of mining machinery and equipment, including accessories for rock drills, pneumatic sump pumps, air compressors, mine hoists and wire rope, centrifugal fan, hose couplings, single drum hoists, drill rods and bits, maintenance tools, skull guards, oxygen breathing apparatus, and rubber hose. Project Implementation Order No. 84-21-007-9-70247 (Invitation No. US-235C). Bids to Central Trust of China, Purchasing Department, 68 Yen Ping Nan Road, Taipei, Taiwan (Formosa). Closing date 1/8/57. B.O.T. Ref.: ESB/16192/57/I.C.A. Telephone enquiries to Chancery 4411, extension 360.

India

TEN/25693B. Crushers, screens, hoppers and conveyors for the National Coal Development Corporation (Private), Ltd. The closing date for the receipt of bids has been postponed to 17/7/57.

Machinery and Equipment

Guiding Conveyor Belts

The Guidler, marketed in the U.K. by The British Wedge Wire Co. Ltd.

Many materials handling operations revolve around the service life and efficiency of conveyor belting, and as the rugged operating conditions found in mines and quarries often cause the belt to run out of line, interruptions in production are often experienced. In addition, misalignment causes the belt edges to become damaged and subsequently the belt deteriorates rapidly.

For many years, both manufacturers of conveying equipment and mine operators have endeavoured to prolong belt life. Various guiding methods have been employed in an attempt to control belts and lessen edge fraying, those in most common use being straight-sided upright guide rollers

Yet the need for a better mechanical control system for belt guiding is obvious. This mechanical control, to be effective, must increase the control area between the belt edge and the guide, and reduce the pressure on each square unit of belt edge. At the same time, the mechanism must have an axial movement to allow for following the natural oscillations of the belt.

These basic requirements are all embodied in the Guidler, marketed in the U.K. by The British Wedge Wire Co., Ltd., an ingenious invention that has already proved its worth in other parts of the world and which is widely used in Scandinavia and the U.S.A. The Guidler employs a hyperbole in its design which, when tilted at the proper angle (30 deg.) to the plane of the belt edge, offers a revolving long line contact surface which guides the belt without damaging the edges.

Because of lack of rigidity every working belt has a tendency to oscillate between the carrying idlers, this oscillation being directly related to load and speed. The Guidler combines an axial movement with its revolving motion and this enables it to follow this normal lift motion of the belt while continuing to exercise perfect control over the belt edge.

The body of the Guidler is a meehanite casting machined all over to very close tolerances and mounted on a steel shaft. A sleeve mounted on the shaft is arranged so that it has a limited axial movement without turning, being restrained by a hexagon nut integral with the shaft at the bottom, and by a pin at the top. The Guidler body rotates on precision ball bearings around the sleeve, and labyrinth seals are fitted to exclude foreign matter.

NEW QUARRY DUMPER

The Abelson 5/7 cu. yd. (8-ton payload) diesel dumper has been introduced by Abelson and Co. (Engineers) Ltd. to meet the requirements of the surface engineering and quarrying industries for a robust on-and-off the road earth-moving dumper which could also be used for hauling rock, stone, gravel and similar materials, with an 8-ton payload and a body capacity of approximately 6 cu. yd. The manufacturers claim that the large capital outlay, coupled with high maintenance costs accrued in the use of existing types of dumpers, has been far too great to show a reasonable return.

In consequence, muckshifters and quarry owners, etc., have been obliged to use standard lightweight tipping lorries which, whilst being perfectly satisfactory on highways, have proved uneconomical when forced to operate under arduous working conditions in quarries.

To make the Austin "701" chassis suitable to accommodate an 8-ton payload, Abelson and Co. have welded two longitudinal 5 in. by 2¼ in. rolled steel channel sections, suitably braced with rolled steel channel cross members, direct on to the top of each chassis side member, thus ensuring that the load is distributed throughout the full length of the chassis. In addition, a 12 ft. long by 14 in. deep by ¼ in. thick steel plate has been welded to each side of the chassis to give greater strength and depth and to ensure that maximum point loads can be accepted in all working conditions.

Bearing in mind that on a fully laden vehicle the greater part of the load is carried by the rear spring hanger bracket, the existing four-bolt type rear spring hanger bracket has been replaced with a larger and heavier seven-bolt type spring hanger bracket, which provides for adequate strength and carrying capacity. The dumper is fitted with double-acting hydraulic anti-roll shock absorbers front and rear to reduce body roll and to stabilise the dumper when working in rough ground conditions. An added feature of the dumper is the power-operated steering, which provides for ease of manoeuvrability with minimum driver fatigue, and relatively high speeds under severe site conditions.

The tipping gear is of the twin underbody frame type of adequate capacity and generous ground clearance, located forward of the centre cross-member of the chassis and oscillating in two bushes fitted in the rolled steel channel chassis. The rams are of the three-stage telescopic type, the last stage being a solid piston rod fitted with Tee piece which locates into the thrust beam on the

The Abelson 5/7 cu. yd. diesel dumper in quarrying operations

The new version of the CP 9 hand-drill

underframe of the body. The penultimate ram is of the double-acting type which provides for a power-operated return of the body from the 70 deg. tipping angle. The high tipping angle provides for a complete discharge of even the most adhesive materials.

HEAT BY THE YARD

In producton processes and in the laboratory the provision of efficient heating of installations having complicated shapes has been greatly simplified in recent years by the availability of the flexible and elastic heating tapes manufactured by Electrothermal Engineering Ltd. These tapes, supplied in a range of sizes, have satisfactorily solved a large number of problems. The long-felt need for a heating tape which can be cut at will, led to the development of " Heat-by-the-Yard ". This enables the user to simply apply heat to practically any pipe, vessel, valve, etc., just by cutting a suitable length of tape from the dispenser and fixing the insulated terminations. Various approximate voltages are required to obtain temperatures and providing the maximum temperature of 450 deg. C. on the heating tape itself is not exceeded it can be used and re-used many times on different set-ups.

" Heat-by-the-Yard " consists of a continuous network of resistance wires enclosed in a knitted elastic sleeve of glass fibre yarn. It is made in ½ in. and 1 in. overall widths. Lengths of 25 ft. or 50 ft. are supplied complete with 6 or 12 connectors. The electrical resistance has been arranged so that a normal working length of 12 ft. would require a voltage of 120 v. while a 23 ft. length would require 230 v. to obtain maximum temperature, i.e. the normal working voltage will be approximately 10 v. per ft. length. If 10 v. per ft. length is exceeded for any reason, then close temperature control is required. In no case should 15 v. per ft. length be exceeded, nor should voltages in excess of 10 v. per ft. be used when the tape is covered with any form of heat insulation. Nickel wire is used in the construction of the resistance network and this will attain its nominal rating at 200 - 250 deg. Centigrade.

Controllers for a.c. and d.c. are both rheostatic and auto-transformers. Maximum input ranges between 110 v. to 250 v. a.c. and is regular at 230 v. a.c. or d.c. Outputs vary from 0 - 135 v. to 0 - 325 v.

IN A NEW GUISE

For operation in confined spaces, the Consolidated Pneumatic Tool Co. have developed a new version of their C.P.9 hand-drill. The new design provides an offset handle which reduces the overall length from 14¾ in. to 11¾ in. and with the provision of shortened steels, the new tool is capable of being employed in extremely small working spaces.

The C.P.9 hand-drill is a miniature rock-drill which has won great popularity for drilling plug holes in tough rock and concrete. It is fully rotational and rapid change from rotary drill steels to non-rotary chisels makes it an extremely versatile tool with a large number of applications.

The weight is only 7½ lb. and complete equipment includes a 1¼ in. T.C. tipped drill-stem, a peg point, flat chisel, metal carrying case, oil can and a length of ¾ in. hose and connections.

WIDE SCOPE OF PLASTICS

The British Plastics Exhibition and Convention, held at Olympia, July 10-20, is the largest and most important international display of plastics materials, machinery and finished products ever held in Britain. The first exhibition in 1951 occupied 90,000 sq. ft. This year it covers 250,000 sq. ft. in Olympia's Grand and National Halls. Buyers are known to be coming in from more than 60 countries.

The plastics industry is growing steadily. Last year Great Britain produced 344,000 tons of plastics—more than double the production of five years ago and treble that of 1947. Exports of plastics materials from Britain in 1956 amounted to nearly 100,000 tons, earning £26,000,000 of foreign currency. Output so far this year shows a 10 - 15 per cent increase and production figures are expected to exceed 1,000,000 tons by 1975.

Among the exhibitors at the exhibition, the Rubber Improvement Group are featuring a wide range of P.V.C., styrene and polythene materials and products, which include many items being introduced to the trade for the very first time. P.V.C. conveyor belting combines high tensile strength with flexibility. This is a major achievement in conveyor belting design. The specially constructed carcass is fully impregnated with P.V.C. and has tough, abrasion and tear-resistant P.V.C. covers, and is unaffected by water, oils, acids, alkalis and most solvents and is, therefore, eminently suitable for all applications.

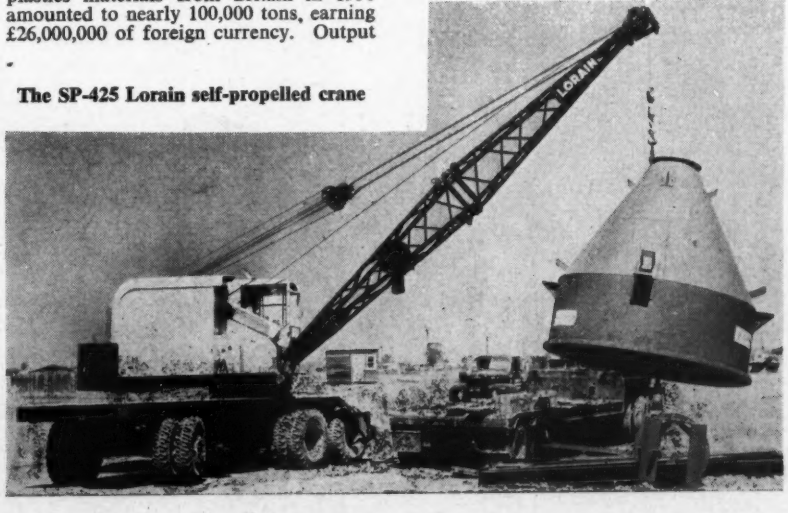
Leonex and Rilon multi-ply P.V.C. conveyor beltings have been firmly established for many years. Millions of feet of this belting are giving satisfactory service in mines and industrial sites in this country, and in all types of mines throughout the world. Leonex " Green-for-Safety " brattice cloth, ventilation tubing, pit-head bath sandals and kneepads, a wide range of products with the accent on safety and efficiency in keeping with the RIL policy of safety in the mines.

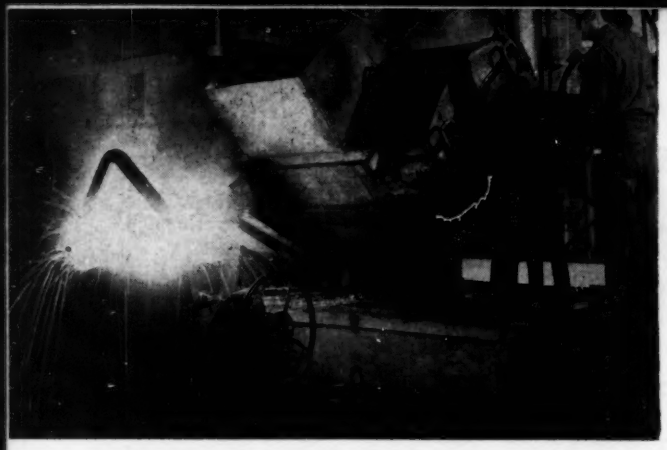
SELF-PROPELLED CRANE

A highly manœuvrable new 25-ton self-propelled crane has been added to the Lorain line of power shovels and cranes. This new Lorain, Model SP-425, needs one man for operation. It has obvious applications for surface work at underground mines as well as at quarries and opencast sites.

Many of the new developments in the shovel-crane industry introduced recently by Thew are incorporated on this newest model. Among these new features, offered as standard equipment on the SP-425, are the shear-ball mounting that eliminates all types of turntable rollers, centre pins and centring gudgeons with their constant maintenance and adjustment, and a 30-ft. pin-connected crane boom of alloy steel of the new Lorain square-tubular-chord design for increased lifting capacities and longer ranges at reduced weight. Available are Lorain's exclusive 2-lever " Joy Stick " controls for air-power operation of all turntable clutch operations. The 6 x 4 carrier is designed for heavy-duty self-propelled service.

The SP-425 Lorain self-propelled crane





The Development of Nodular Iron

Mackay Industrial Equipment, Ltd., announce that Allis-Chalmers have developed a metal that machines as easily as common grey iron, yet is as strong as cast steel. This metal is now being used in the manufacture of many of Allis-Chalmers products. Called "nodular" iron because of the arrangement of the graphite particles in the metal, it possesses characteristics which indicate it is capable of an important rôle.

Nodular iron is roughly three times as strong as grey iron and about the equal of cast steel in that respect. In fact, the most logical application of nodular iron is as a replacement for steel castings. The fact that nodular iron has the properties of steel along with the machinability features of grey iron makes it an extremely desirable metal from which sound and intricate castings can be produced. Where ordinary grey iron has a tendency to be brittle and to crack easily, nodular iron is very ductile, or pliable.

The cost of nodular iron is between that of grey cast iron and steel, but the superior machinability of nodular iron may help reduce the product cost. Since nodular iron is slightly more expensive than grey iron, it will not replace grey iron where the latter meets the requirements for a particular application.

The combination of great strength and ductility gives nodular iron the quality of toughness. It is also heat and wear resistant. Another advantage of nodular iron is that it does not have to be annealed, but can be used as cast. Because of its physical structure, nodular iron is superior to steel in applications calling for the casting of a thin section. The iron has more fluidity in the molten state than steel, making it possible to produce more intricate castings.

The future of nodular iron is virtually unlimited, since every steel casting used is a potential nodular iron application. Some forgings also may be replaced with nodular iron. A few common uses it can have would include rollers, cylinder heads and liners, diesel engine pistons, gears, forming dies, and parts for mining and other machinery. Nodular iron is being used in transmission housings for crawler tractors, mechanism housings for vibrating screens, and parts for ore crushers and electric motors.

During the production process of nodular iron the special melt is poured from the cupola into a ladle, shown above. Below left, a photomicrograph of common grey iron in which the free graphite is present in the form of flakes. Below right, graphite specks in nodular iron, the metal being more continuous and thus stronger and more ductile in this form

A British iron research group initially developed nodular iron, which has been known commercially since 1948. However, that process called for the addition of cerium, an expensive metal, to the iron to bring about the desired change in the physical structure. Later, magnesium alloys containing nickel and copper were used in the U.K. and in the U.S.

In common grey iron, graphite is present in the form of minute flakes which act as cracks to weaken the metal. In nodular iron, the graphite is drawn into tiny nodules which strengthen it as well as improve its machinability. Providing the foundry facilities are available, castings weighing thousands of pounds can be made from nodular iron.

DETECTING UNEXPLODED DYNAMITE CHARGES

A new method of detecting unexploded charges of dynamite has recently been developed by the Canadian Department of Mines. The system depends on the use of radioactive isotopes as tracer or "tell-tale" elements.

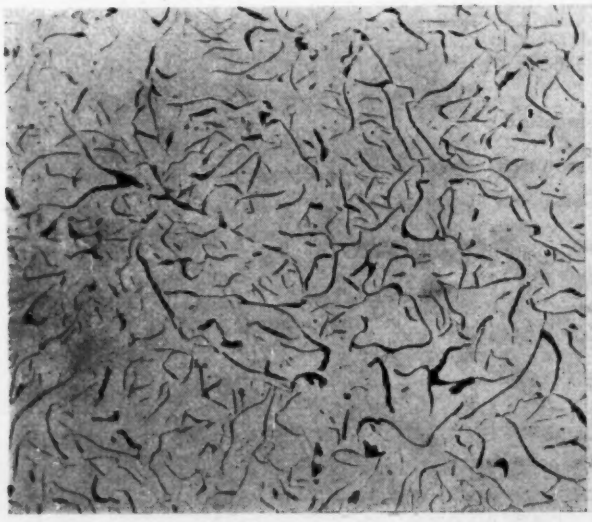
When radioisotopes are used in this way, any unused part of the charge can be detected by means of a radiation detector, such as a Geiger counter, which will react positively if any part of the explosive charge remains unexploded.

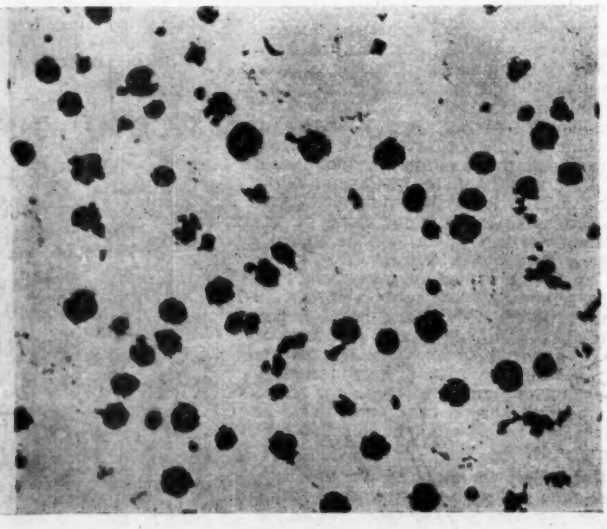
A radioisotope having a half-life of between 30 and 70 days, such as antimony-124, has been suggested as the most practical radiation marker for use under these conditions.

NEW U.S. PLATING PROCESS

A new plating process, using special chromium compounds instead of tinplate, has been developed by the Heintz Manufacturing Co., United States. Black plate treated by this Hinac process is being made by the Bethlehem Steel Co.

In this application Hinac is claimed to be superior to tinplate because of its greater resistance to alkalies. The process can also be applied to stainless steel and to non-ferrous metals such as aluminium and zinc. The method is applicable to high-speed operations since the processing requires only a few seconds.





Metals and Minerals

How Much Nickel Can The Free World Use?

The U.S. Government has rejected a proposal by International Nickel that it should contract to buy up to 75,000 s.tons of nickel from the company's newly announced project in northern Manitoba during a 2½-year period beginning on July 1, 1960, if I.N.C.O. could not sell this quantity privately. Under the proposed arrangement, the U.S. Government would pay I.N.C.O. 74 c. a lb.—roughly the current market price—or the prevailing U.S. market price at the time of purchase, whichever was the lower. The agreement sought by I.N.C.O. was broadly similar to one signed last March by the G.S.A. and Freeport Sulphur.

According to Mr. Franklin G. Floete, chief of the General Services Administration, the Government's refusal is based on various considerations, including the fact that nickel expansion already under way promises to make a total of 220,000 s.tons available to the U.S. by 1961, against the current level of approximately 150,000 tons.

It has become increasingly evident that in the U.S. Government's own long-term plans for the expansion of nickel supplies, the highest priority is being accorded to the vast laterite deposits of Cuba, which remained unexploited for many years on account of technical difficulties.

Nickeliferous iron ores constitute the world's largest potential source of nickel, but the low nickel content and the refractory nature of the ores has limited their development to a few isolated occurrences. The average nickel content ranges from a little above to a little below 1 per cent. The total reserves of nickeliferous iron ore in the Mayari, Moa, and San Felipe districts of Cuba are estimated at about 3,000,000,000 tons, but no estimates of recoverable nickel have yet been made. Immense deposits of nickeliferous iron ores comprising hundreds of millions of tons are also known to occur in the Philippines, Celebes, and parts of Borneo.

Last year the U.S. Government plant at Nicaro, Cuba, supplied about 16,500 s.tons of nickel; by 1960, it should have an annual capacity in the region of 25,500 tons. In addition, pilot plant work on a new process to extract nickel and cobalt from Cuban ores has been successfully concluded and preparations are being made for a commercial project to produce 25,000 s.tons of nickel annually.

The annual total of 50,000 tons so far projected from Cuban ores is roughly equivalent to 25 per cent of the free world production in 1956. Assuming that the new Moa Bay venture proves successful, the U.S. Government may well encourage the further expansion of production from Cuban ores. Moreover, Government incentives apart, companies operating in Cuba would have the advantage of lower wages and taxes than Canadian producers.

The possibility of establishing a ferro-nickel industry in the Philippine islands, in which both North American and local firms are interested, has been enhanced by the large potential low-cost power now being made available through the construction of new hydro-electric plants. The U.S. Bureau of Mines is running pilot-plant tests to obtain design and cost information for the production of high-grade ferro-nickel from Philippine ores.

There might also be a significant increase in future years in nickel supplies from other new sources; notably, Southern Rhodesia, where the Empress prospect is regarded as extremely promising.

Meanwhile nickel remains scarce, but the supply situation is at last becoming rather less acute, largely as a result of substantial diversions of metal from the U.S. stockpile to industry. At present defence and stockpiling absorb some 40 per cent of the supplies available in the free world.

In these circumstances the magnitude of I.N.C.O.'s expansion programme is a robust expression of confidence in nickel's future prospects. The Manitoba project alone, from which initial production is expected in 1960, may ultimately have a yearly output of 35,000 s.tons. According to Mr. Ken Clarke, Canadian sales and market development manager of I.N.C.O., the company's annual production will reach 180,000 s.tons by the end of 1960, by which time free world production will have risen from the present level of 225,000 s.tons to 377,500 tons. Mr. Clarke estimated that to consume the very large quantity of nickel which would thus become available, civilian uses would have to increase by 75 per cent by 1961.

It is, of course, conceivable that growing production from laterites might necessitate a re-appraisal of the future outlook, more especially if the price of Canadian nickel is adversely affected by the drastic changes in taxation introduced by the Ontario Government, which appear to be both shortsighted and ill-conceived. On the other hand, Canadian producers are obviously convinced of their ability to develop the new markets indicated by research and development over a long period, which cannot be exploited until nickel is once more plentiful.

Dr. Thompson has referred to the large number of new applications which the industry is keeping "in cold storage" until an easier supply position permits their introduction. Their appearance in due course is awaited with the greatest interest by the metal industries and their customers, and by no means least by I.N.C.O.'s stockholders, whose faith in the company is strikingly demonstrated in the stock exchanges of the world.

Mr. H. J. Fraser, vice-president and general manager of Falconbridge, considers that a world consumption amounting to 500,000 tons of nickel annually could well be realized in 25 years' time. To meet this predicted demand a new Falconbridge every 2½ years, or a new I.N.C.O. every 14 years, would be required.

Though I.N.C.O.'s approach to the U.S. Government seems to indicate a possibility that the horizon may not be entirely cloudless, past experience with other metals—notably aluminium—suggests that when nickel does at last become available in adequate quantities, its progress may be fully up to the expectations of producers, however optimistic they may now appear.

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Japanese primary nickel and ferro-nickel manufacturers have decided to cut the prices of products supplied to domestic consumers by between 100,000 and 200,000 yen per ton.

FALL IN BARTER CONTRACTS

The U.S. Department of Agriculture reports that in May this year it signed contracts worth $6,500,000 to barter U.S. surplus commodities for foreign produced strategic materials. In April this year, similar contracts worth $28,900,000 were signed. The materials contracted for in May, 1957, included $4,300,000 worth of chromite, $1,000,000 worth of lead, and $1,200,000 worth of zinc.

BORON IN GROWING DEMAND

In line with the increasing demand for boron in industry, as well as in guided missile and other developments, U.S. Borax and Chemical Corporation is carrying out a $20,000,000 expansion programme, which will increase its capacity to turn out boron products by about 30 per cent. Demand for boron products is stated to have doubled in the past ten years. The company, which is 50 per cent owned by Borax (Holdings) Ltd., of the U.K., owns about 70 per cent of the known U.S. high-grade reserves, while the U.S. accounts for about 90 per cent of the total world output.

The most significant development in this expanding industry is the use of boron as a fuel in high-speed altitude aircraft and missiles, but increasing outlets are also being found in industrial applications. For instance, three U.S. companies at the present time are using boron as an additive to their petrol to provide increased economy and lower engine maintenance costs for cars.

As a result of studies at the Baltimore Works of Armco Steel Corporation it has been found that traces of boron added to austenitic chromium-nickel and chromium-manganese alloys greatly improved their hot working properties. This discovery has led to a new patented process for improving hot workability and increasing mill yields of stainless steels.

U.S. METAL ALLOTMENTS

Reflecting lesser demand, the U.S. Office of Defence Mobilization has announced smaller allotments of steel, copper, aluminium and nickel alloys to fill U.S. defence and atomic energy requirements for the fourth quarter of this year. The allotments for steel were 7 per

cent below those for the third quarter, copper was 4 per cent lower, aluminium 12 per cent lower, and nickel alloys 16 per cent lower.

FLUORSPAR IN THE U.S.

Fluorspar consumption reached a new record in the U.S. last year, the total of 618,500 s.tons representing an increase of about 8 per cent over consumption in 1955, according to reports by the Bureau of Mines. Consumer demand was met by increases in both production and imports. Domestic output of finished fluorspar totalled 309,500 tons and shipments were 319,900 tons, compared with production of 239,500 tons and shipments of 279,500 tons in 1955. Imports for consumption (from Canada, Germany, Italy, Mexico and Spain) rose to the new peak of 490,700 tons—an increase of about 35 per cent over 1955.

A substantial amount of acid-grade fluorspar was imported by the U.S. Government under contracts bartering surplus agricultural commodities. In July the government was authorized by Congress to begin the purchase of 250,000 s.tons of newly mined domestic acid-grade fluorspar at a base price of $53.00 per s.ton with bonuses and penalties for the silica content present.

U.S. CHROME RESOURCES

Reappraisal of chromite deposits in the U.S. by the Geological Survey indicates much larger reserves and potential resources than the figures previously published. The new estimate is about 3,500,000 l.tons of chromite oxide in the ground, compared with 2,000,000 tons estimated in 1945. However, the larger estimate is mostly made up of very low-grade material which cannot be mined profitably at current prices.

In terms of national requirements for chromium, reserves remain limited. The U.S. used about 740,000 l.tons of chromium oxide in all grades of ore in 1956 and an average of about 530,000 l.tons a year in the last five years. At the 1951-56 rates of consumption, indicated reserves would last two to three years and inferred reserves for another three to four.

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Chrome is a little weaker in New York and some sellers have made offers to consumers at lower prices than those quoted a month ago. The major suppliers, including those of Turkish chrome ores, are strong enough to hold out, but some of the smaller ones have begun making offers for delivery in the third and fourth quarters of this year.

U.S. ALUMINIUM PRICE

Although consumer demand for aluminium in the U.S. has tapered off, a further rise in prices early next August is still expected. Wages in the industry are scheduled to be raised on August 1 under a three-year contract signed last year. The second instalment on pay and benefits is expected to be equivalent to a 7 per cent rise in total labour costs for both hourly and salaried employees, but it is anticipated that, because of the current slackening in demand, only part of the rise will be passed on to consumers. The price increase is expected to range from ½ c. to 1 c. per lb. on aluminium pig, which at present sells at 25 c. per lb.

SPAIN'S MERCURY EXPORTS

Our attention has been drawn to an error in the last paragraph of an article reviewing the mercury trade in 1956, which appeared on page 821 of our issue of June 28. The figure of 32,450 flasks given for Spanish mercury exports in 1956 should refer only to the period January - October. For the full year exports from Spain are in the region of 41,000 flasks, the exact total being not yet available. This represents a substantial increase over the 1955 total of 32,245 flasks.

COPPER · TIN · LEAD · ZINC

(From Our London Metal Exchange Correspondent)

The upward movement in prices during the earlier part of the week was due more to a lack of sellers than anything else and by Wednesday the undertone was once more weak. The consumption of all metals remains at a good level for the time of the year but owing to the holiday season, new demand is not forthcoming at the moment.

SPOT COPPER REMAINS WEAK

The copper market has had no definite news to cause a revision of previous opinions that without any further action on the part of producers to reduce output there will be a period of weakness in the price: the contango has shown signs of widening, whilst stocks in official warehouses increased by a further 250 tons during last week.

No further news has been received from Chile about the rumoured cutback in production and it is being pointed out in some quarters that under the Chilean copper law, any revision in production in Chile must be matched by a similar reduction in the States. Anaconda has already cutback about 16 per cent on its production in the States, but Kennecott have not yet announced any action on their part. It is also felt that action in Chile might result in other producers making cuts, the most important being those in the Belgian Congo and on the mines belonging to the Anglo American Corporation in Rhodesia.

In spite of the expected weakness in the market in the near future, it is still felt that action by producers will cause considerably higher prices by the end of the year. With reference to the proposal by the Rhodesian producers to U.K. copper consumers, it is understood that the consumers have been unable to accept the producers' formula and that a small sub-committee has been appointed: the presumption is that the terms of reference are to endeavour to compose the draft of a counter-proposal which will have to be agreed by the consumers before forwarding to the producers.

In the States, business has remained fair and quotations stationary with some customs smelters complaining about the price which they have to pay for their scrap.

THE "BACK" LESSENS

The tin market has been featureless and has tended to drift downwards in spite of the continued trouble in Singapore Harbour. The backwardation has inclined to lessen and during last week, stocks in official warehouses rose by 154 tons. On Thursday morning the Eastern price was equivalent to £768 per ton c.i.f. Europe. Exports in June from Malaya totalled 5,128 l.tons which is somewhat below the May figure and which brings the total for the half-year to 36,210 tons.

SPLIT PRICE FOR U.S. ZINC

The lead and zinc markets have been completely featureless, with the one exception that the Belgian strike situation is still causing the maintenance of a substantial backwardation in zinc. There are as yet no signs of the strike ending but it is understood that not all zinc smelters are affected. In America the split-price remains but it is understood that no sales are being made at the 10½ c. per lb. level, all contracts being either at 10 c. or at the average price basis. It appears that some producers consider that if a flat 10 c. was established there would be further talk of a downward movement, whereas by maintaining the present set-up, this is to some extent avoided.

The latest figures published by the American Zinc Institute show that production in June at 90,719 s.tons was some 6,000 tons lower than in May but deliveries during the month were substantially lower at 69,957 tons which is some 20,000 tons lower than in the previous month, this resulted in stocks once more increasing to the very high figure of 133,455 tons. As far as the U.S. Government's activities are concerned, it is understood that the June intake of lead and zinc was up to the higher tonnage taken in May but that this was still far below the surplus: during May the Department of Agriculture signed barter contracts which covered amongst other things $1,000,000 worth of lead and $1,200,000 worth of zinc.

Closing prices and turnovers:

THE WEEK ON THE L.M.E.

	July 4		July 11	
	Buyers	*Sellers*	*Buyers*	*Sellers*
COPPER				
Cash	£222½	£222¾	£216¾	£217
Three months..	£223	£223¼	£219	£219¼
Settlement ..	£222¾		£217	
Week's turnover	7,325 tons		3,550 tons	
LEAD				
Current ½ month	£91	£91¼	£90¾	£91
Three months ..	£91¼	£91½	£91	£91¼
Week's turnover	3,600 tons		5,275 tons	
TIN				
Cash	£764	£766	£753	£754
Three months ..	£760	£761	£751	£752
Settlement ..	£766		£754	
Week's turnover	1,160 tons		845 tons	
ZINC				
Current ½ month	£77	£77¼	£76	£76¼
Three months ..	£75	£75¼	£73¾	£74¼
Week's turnover	7,225 tons		7,000 tons	

London Metal and Ore Prices appear on page 60.

Mining Finance

A Bounty for Australian Gold Producers?

The President of the Chamber of Mines of Western Australia, Mr. R. J. Agnew, recently emphasized that if costs continue to rise the minimum grade of ore that can be profitably mined must also rise.

The basic wage in the State is now £A13 6s. 7d. per week, an increase of 10s. 8d. during the past year, bringing the minimum weekly wage—with allowances—in the industry to £A15 6s. 7d. Government assistance has already been given to the industry, but assuming a government policy aimed at producing the maximum amount of gold during the lifetime of the industry a bounty per oz. of gold should be paid to all producers while continuing the subsidy to marginal mines, for certain of which increased assistance is needed.

During 1956, 2,870,273 tons of ore were mined compared with 2,865,048 in the previous year but gold production decreased from 834,326 oz. in 1955 to 813,517 oz. At the annual meeting of the Australian Mines and Metals Association the need for increased assistance to the industry under the Gold Mining Industry Assistance Act was stressed to provide for larger development and prospecting allowances, a matter on which requests have been made to the Federal Government by the several Chambers of Mines. Aid from the Act in the past year was rather less than £500,000.

The view was given that the industry faces a difficult period with further increases in costs and no increase in the price of gold. Approval was expressed at a recent finding of the Commonwealth Arbitration Commission to determine the basic wage on the capacity of the industry to pay, which system, in place of quarterly adjustments, would introduce an additional stabilizing influence on current inflationary trends.

INCREASED DEMAND FOR GEMS

De Beers Consolidated Mines announced at the end of last week that sales of diamonds, both gem and industrial, effected through the Central Selling Organization for the three months to June 30, totalled £19,949,451 which compares with £17,742,014 in the first quarter of the year.

The feature of the latest quarterly sales figure was the increase in the turnover of gem stones to £14,467,447. This was the highest level reached since the March quarter of 1955, and compared with sales totalling £10,972,484 in the March quarter of this year.

The significant rise in the turnover in gem stones more than offset the decline in the sales of industrials, which shrank to £5,482,004 from £6,769,530 in the March quarter. The reduced turnover in industrial stones was, in part at any rate, expected as warnings have been given for some time past that lower sales of these qualities was to be anticipated owing to the falling off of purchases for the U.S. stockpile.

NCHANGA PROFITS SLUMP

The steep fall in the copper price since the beginning of last year is reflected in part in the preliminary profit statement of Nchanga Consolidated Copper Mines, the important Northern Rhodesian producer.

Working profits slumped by as much as 40 per cent, and although this fall was cushioned to some extent by the built-in shock absorbers, lower tax liabilities and reduced copper bonus payments and royalties, net earnings nevertheless dropped from £16,200,000 to £9,500,000.

The market had expected profits would suffer severely, but on the whole was not displeased with the results. They do, however, sound the warning that the coming results of the other Northern Rhodesian Copperbelt producers will be even more seriously affected, reflecting as they will the continuous decline in the copper price throughout the whole year.

FRESNILLO RE-OPENS GOLD MINE

The Fresnillo Co. is to re-commence work at Round Mountain, the openpit gold-mining operation in Nevada which closed down in 1952.

In a circular to stockholders, the company stated that it has given intensive study to the possibility of renewing operations on a profitable basis. Additional test drilling carried out within the past year indicated the feasibility of mining a part of the orebody, the gold content of which is considerably greater than the average of the whole deposit. Accordingly, Fresnillo entered into a contract with the Morrisson-Knudsen Co. which is experienced in this general type of operation, is well acquainted with the Round Mountain property, and with the problems that made the previous operation unsatisfactory.

It is planned to commence preliminary stripping of the deposit and the renovation of the washing plant in the near future so that productive operations can be started in the spring of 1958. If, in the mining of the high-grade portion of the deposit, stability of operations at moderate cost can be achieved, much more of the deposit will become profitable and operations could continue for several years.

OUTLOOK FOR GREAT BOULDER

Great Boulder Pty. Gold Mines, one of the great mines of Kalgoorlie and Western Australia, achieved record profit and production figures in 1956. Earnings last year of £A258,512 were obtained from the treatment of 489,494 tons of ore

LONDON MARKET HIGHLIGHTS

During the week July 4 to July 11, the Kaffir market was dull and uninteresting—a disappointment in view of the steady undertone displayed during the past five weeks and the proximity of the forthcoming quarterly reports.

In general, the whole market was easier and Brakpan, earlier in the week, dropped to 4s. 1½d., its lowest level for many years, before finishing the week fractionally better. Paris buying helped Randfontein. A small feature was the advance of New Wits on Wednesday by 9d. to 5s. 6d. on expectations of a higher dividend distribution. But it was left to Gold Fields to provide the point of interest as the shares persistently moved against the trend, the new units advancing to a premium of 5s. 9d. and the shares to 48s. 6d.

Coppers were mainly dull, although bear closing helped Nchanga recover some of its losses. The dividend, detailed elsewhere, was as expected, but the market took a better view of the results than generally anticipated. In lead-zincs, Mount Isa responded well to the record production figures and closed the week higher at around 29s.

Tins have been quietly firm with one or two good features. Southern Tronoh advanced to 10s. 1½d., their highest point since 1955, and better production figures were also responsible for the improvement in Kinta to 28s. 9d. and Hong Kong to 6s. 9d.

Elsewhere, Amits proved an attraction for one day, the shares leaping 8s. 9d. to 185s. 7½d. on what is thought to be U.S. buying. Rio Tinto continued to move ahead presumably on their Canadian interests. The shares at their present price of 101s. 3d. may be vulnerable. St. John d'El Rey has been under a deal of selling pressure and closed the week several shillings down at 51s. 3d.

Chartered, whose shares had gone ahead steadily on the hopes that companies incorporating by Royal Charter to develop overseas resources would qualify as O.T.C.'s, boiled over and finished the week a few shillings off at 70s.

The closing of one of the principal loopholes by which U.K. investors could purchase U.S. and Canadian securities, thereby enlarging the available pool of these stocks in the U.K., sent the premium up to as high as 15¼ per cent on Monday before it came back at the end of the week to about 12 per cent. Some good price rises resulted, including Belcher Mining, Rio Tinto's Canadian uranium companies, and, initially, International Nickel. However, following the news of the U.S. Government's refusal to purchase Inco's output for the stockpile, the shares dropped heavily (see page 55).

for the recovery of 124,604 oz. of gold, all record figures.

Developments continue to be satisfactory and ore reserves, despite the large tonnage mined, are estimated at 2,071,500 s.tons, with an average grade of 5.5 dwt. gold per ton, an increase in both tonnage and value.

Substantial additions to ore reserves are coming from the development of minor lodes, and the discovery of new similar orebodies in the upper levels of the mine; but of particular importance are the developments at the bottom levels of the mine which show persistence in length, width and gold content; values are, in general, rather better than the average grade of the mine. The trend of development work is steadily increasing the value, and the prospects of the mine, which is well managed, and has an assured future beyond the term of the ore reserves.

As over 80 per cent of the company's shares are held in Australia and the control and management are in this country, it is proposed to transfer the whole of the company's undertaking to Australia, retaining the same directors as at present and representation in England by the present London secretaries.

EXPORT TAX UNDER FIRE

Mr. W. M. Warren, chairman of Malayan Chamber of Mines, at the annual meeting held in London earlier this week, said that the report of the International Bank Mission in Malaya supported the industry's case that the high rate of export duty was a serious deterrent to the development and mining of low-grade tin-bearing ground. And it was feared that the large expenditure on domestic development and social schemes envisaged by the Federation Government would not permit of any early reduction of either the export duty or tax.

FINANCIAL NEWS AND RESULTS IN BRIEF

S.A. June Gold Output. — South African gold production last month was 1,420,021 oz. This fell short of the record output in May of 1,450,668 oz. and compares with 1,351,465 oz. produced in June, 1956.

The number of Africans employed by the mines at the end of June was 335,756.

South Bukeru Areas.—South Bukeru Areas, who ceased mining operations on March 2, 1956, had a net current assets figure of £40,168 at December 31. During the year, mining account showed a loss of £1,452, and Investment account a loss of £199. Meeting: London, August 7.

Sungei Kinta Tin.—At £66,401, profits before tax of Sungei Kinta Tin Dredging showed a slight improvement on last year's £62,548. Of this, taxation took £39,870 (1955, £26,159) and dividends (including the proposed final of 3s.) £25,875. £16,995 is carried forward. The meeting will be held in London on July 31. Chairman, Mr. R. Ellerton Binns.

Fort Reliance and Mystery Lake.—Two areas totalling 52 claims in the Mystery Lake area of Manitoba are the subject of an option agreement between Rio Tinto's subsidiary, Rio Canadian Exploration, and Fort Reliance Minerals. Rio Tinto are to conduct an airborne

Rayrock Opens Up.—Rayrock Mines made their first shipment of uranium precipitate on June 24, milling having begun on June 17. Mr. J. C. Byrne, the President, says that mill performance is comparing favourably with the test-work previously conducted at Ottawa. Most of the mill feed for the next three months will be development ore from surface stockpiles.

Lobitos Oil Pays Same—Plus.—Lobitos Oilfields earned £640,049 in 1956, a 50 per cent increase on the previous year's figure. Although the final dividend remains at 8 per cent, making 14 per cent for the year (same), a special payment of 4 per cent is to be made out of profit on the sale of investments. The annual general meeting will be on July 29. Chairman, Mr. F. C. Bowring.

Gopeng and Pengkalen—Capital Repayments.—Gopeng Consolidated and Pengkalen have announced that resolutions confirming the repayments of capital (Gopeng 1s. 6d. per 5s. unit; Pengkalen 4s. per 5s. unit) have been passed by overwhelming majorities, and that steps will now be taken to obtain Court approval.

Tweefontein Colliery.—In the year to March 31, Tweefontein Colliery received £31,944 in dividends, a substantial increase on the previous year's £20,617, due to a change in dividend dates by Tweefontein United Collieries. The net profit showed a similar rise (£10,282 to £16,860) but the dividend recommended is unchanged at 17½ per cent. The carry-forward moves down, however, £13,000 being transferred to general reserve. The meeting will be held on July 30 in London. Sir Joseph Ball is chairman.

Westminster Bank.—Westminster Bank are to pay 6¼ per cent on the "A" stock and 2s. on the "B" shares for the first half of 1957. Evidence of growing inflationary pressures appear in the half-yearly statement of accounts; advances, which only rose by £6,000,000 in the whole of 1956, have moved up almost £10,000,000 since December. Another feature is the gap between the market value of the Bank's holdings and the value at which they appear in the statement has narrowed. This seems to be due to the fact that the portfolio consists entirely of dated stocks, the majority maturing within ten years.

Mount Isa's Record Outputs.—Mount Isa Mines, the big Queensland copper-lead-zinc-silver producer, achieved a record output of both copper and lead during the year ended June 30.

Total tonnage ore treated during the year was 1,297,000 tons, some 85,400 tons less than in the preceding year, but the output of blister copper improved 1,827 tons to 26,335 tons and that of lead by 4,330 tons to 40,875 tons. The output of zinc concentrates also showed to advantage over the previous year, but the output of 32,603 tons was still below that recorded a few years ago.

Phoenix Prince Gold Mining.—In spite of a fall in taxation from £13,829 last year to £8,647 in the year ended March 31, 1957, Phoenix Prince's net profits slumped to £9,968 from £24,815. The dividend is again passed. The chairman, Mr. Alexander Macquisten, in his circulated statement expresses the hope that some of the benefits of the Overseas Trade Corporation Bill will apply to the company, especially with regard to the 10 per cent depletion allowance made by the Rhodesian Government. The meeting will be held in London on July 31.

New Finance Arrangements for Buffelsfontein. — Buffelsfontein Gold Mining have come to new arrangements with Anglo American Corporation for the repayment of the £2,500,000 loan made by the Corporation to them. Instead of the traditional 50 per cent of profits available for dividends being set aside for repayment, redemption will be made by fixed instalments rising from £250,000 in 1958 to £750,000 in 1962. The loan will carry interest at the rate of 6½ per cent instead of 5½ per cent but, the directors say, the new arrangements will facilitate the planning of future capital expenditure and more profit will be available for early dividends.

North Charterland to Sell Fort Jameston Assets.—In a circular to shareholders, the directors of North Charterland Exploration say that trading conditions in the Fort Jameston district of Northern Rhodesia have recently worsened. In view of this, the company has decided to dispose of its garage and trading station at this important road junction about 100 miles east of the southern part of Lake Nyasa. The proceeds will be used for "more profitable investment in Southern Rhodesia".

Atlas' Profit. — Atlas Consolidated Mining, who operate a large copper mine in the Philippines, earned a net profit of Philippines pesos 6,790,444 in their first full year of operation. Their annual report discloses that Atlas has formed a new company in partnership with Phelps Dodge, Phelps Dodge Copper Products Corporation of the Philippines, which is to establish a plant in Mandaluyong to draw copper wire and manufacture electrical cable.

Yukon Consolidated Gold. — At $301,013, Yukon Consolidated Gold's net earnings in 1956 showed a small increase on the previous year's $284,474. In his statement, the president, Mr. W. A. Arbuckle, says that a copper prospect and an asbestos showing in the Dawson district are to be abandoned, but that in the current year the joint exploration programme with Consolidated Zinc of Canada, will reach a new peak of activity. A more aggressive investment policy is being pursued. The meeting is to be held in Toronto on August 7.

Nchanga's Profit 40 Per Cent Down.—Nchanga's preliminary figures for the year ended March 31 give a first indication of the effect of the drooping copper price on the Rhodesian Copperbelt producers. From a 1956 figure of £16,219,713, net profit after tax tumbled to £9,528,798. The final dividend of 15s. net follows the interim in being 33¼ per cent lower than in the previous year, absorbing with the earlier 5s. £7,000,000. The appropriation for capital expenditure is £500,000 lower at £2.500.000, and last year's transfer of £3,500,000 to general reserve is not repeated.

THE ZAMBESIA EXPLORING CO. LTD.

CAPT. RT. HON. CHARLES WATERHOUSE'S REVIEW

The Annual General Meeting of The Zambesia Exploring Company, Limited, was held on July 10, 1957, at The Chartered Insurance Institute, E.C.2. **Capt Rt. Hon. Charles Waterhouse, M.C., D.L., M.P.** (Chairman) presided.

The Chairman informed the Meeting that Sir Ulick Alexander had indicated his willingness to rejoin the Board. Referring to the invitation which he had himself received to follow Sir Ulick in the chairmanship of Tanganyika Concessions Limited, he expressed his thanks to stockholders for their kindness during his tenure of office.

He observed that the company had received its share of benefits during the period of high copper prices, and, although there was confidence that demand for copper would again catch up with supply, the recent substantial price-fall made it advisable for prospects during the next two years to be reviewed with caution.

The Chairman regretted that the Chancellor of the Exchequer had not in this year's Budget extended to mining finance houses the reliefs accorded to companies directly engaged in overseas mining operations. The mining finance house fulfilled as important if not as glamorous a function as the company actually mining overseas.

The Chairman's Review circulated with the Report and Accounts, stated that the profit before taxation for the year ended March 31, 1957, was £88,715 for the parent Company and £154,880 for its wholly-owned subsidiary, The Zambesia Investment Company, Limited, making a total of £243,595. An interim dividend of 6% less tax had been paid, and provision made for a final dividend of 14%, less tax, making a total of 20% for the year. The total reserves of the parent and subsidiary companies taken together had increased from £605,832 to £676,079.

The remaining £45,972 of the unissued share capital had been offered at par as to £45,429 to stockholders in the proportion of one new share for every complete £21 of Ordinary Stock held at May 10, 1957, and the balance of £543 to the staff. The proceeds of the issue would assist the company to continue to play its part in the development of Central Africa.

Subsidiary Company

The profit of The Zambesia Investment Company, Limited, after provision for taxation of past and current years, was £90,627, and that amount had been added to the balance carried forward from the previous year, which was thereby increased from £226,715 to £317,342. In addition, the surplus of £62,741 arising from a change of Investments had been credited to Capital Reserve Account, which now totalled £113,414.

As previously, the charge for profits tax in the accounts of The Zambesia Investment Company was at the rate charged on undistributed profits, and that would be the maximum rate payable so long as profits were not distributed to the parent Company.

The Report and Accounts were adopted, and Resolutions increasing the Authorized Share Capital to £1,500,000 by the creation of 500,000 new shares of £1 each and approving new Articles of Association were agreed to.

THE KADUNA SYNDICATE

The 46th ordinary general meeting of the Kaduna Syndicate, Limited, was held on July 10 in London, **Mr. Hector R. Mackilligin, M.Inst.M.M.** (the chairman) presiding.

The following is an extract from his circulated review: Production during the year amounted to 304 tons of tin concentrate of shipping grade, compared with 241.5 tons in 1955. The average cost per ton delivered f.o.r. was £258 15s. 10d., as compared with £276 16s. 9d. in the previous year. Sales of tin ore amounted to 300 tons and realised £166,030, an average of £553 8s. 8d. per ton.

Mining profit for the year, after providing for various charges, was £43,621, as compared with £35,245 in the previous year.

Under the International Tin Agreement producing countries are contributing to a Tin Buffer Stock. This Company has been called upon to provide approximately 36 tons of tin metal or its equivalent at £640 per ton. It is in the Company's interests to make its contribution wholly in cash. The total amount is approximately £23,072, of which 60 per cent, namely £13,843, has been called for and paid.

Output for the first five months of the current year has amounted to 125¼ tons, as compared with 166 tons in the corresponding period of last year, but it is hoped that at least a substantial amount of this reduction will be made up during the remaining months of the year.

The report was adopted and a total distribution of 50 per cent approved.

KADUNA PROSPECTORS

The 42nd annual general meeting of Kaduna Prospectors, Limited, was held on July 10 in London, **Mr. Hector R. Mackilligin, M.Inst.M.M.** (the Chairman), presiding.

In his review circulated with the report and accounts, the Chairman said that sales of tin ore amounted to 50 tons and realised £28,176, an average of £563 10s. 5d. per ton.

The mining profit for the year, after providing for various charges, was £3,960 as compared with £2,486 in the previous year.

Of the output of 71 tons, 25½ tons were recovered from the recorded ore reserves and 45½ tons from outside of them. As 18 tons were added during the year, the estimated reserves at December 31 amounted to 99 tons.

Under the terms of the International Tin Agreement, the Company had been called upon to provide approximately 9.91 tons of tin metal or its equivalent at £640 per ton towards the Tin Buffer Stock. As the price of tin was considerably above £640, it was in the Company's interests to make its contribution wholly in cash. The total amount was £6 342, of which £3,808 had been called for and paid.

Output for the first five months of the current year had amounted to 27 tons, as compared with 18½ tons for the corresponding period of 1956. The Directors hoped that, if the price of the metal remained at a satisfactory level, the dividend for the current year would at least equal that for the year under review.

The report was adopted and the dividend of 16¾ per cent approved.

IDRIS HYDRAULIC TIN

MR. A. G. GLENISTER'S STATEMENT

The forty-third annual general meeting of Idris Hydraulic Tin, Ltd., was held on July 10 in London.

Mr. A. G. Glenister, C.B.E., Chairman, presided.

The following is extracted from his Statement circulated to Shareholders:—

Sale of Kranji Section

The year under review is notable for the success of the negotiations leading to the sale of the Kranji Section to the French-owned Company operating alongside it, for £160,000.

The sale of the Kranji Section enabled the Board to declare a special cash distribution of 2s. per share on account of the Capital profit arising from the sale, also to recommend to Shareholders a repayment of capital of 4s. per share, thereby reducing the issued capital of the Company to £24,000 and the nominal amount of each share to 1s. The sanction of the Court has been obtained and the repayment will be made as soon as possible after receipt of the Order.

Development at Batu Karang

It will be recalled that the issue of a Mining Lease over a stretch of the main road and road reserve at the Batu Karang Mine was approved subject to the satisfactory deviation of the existing road. During the first half of the current year good progress has been made with this and other development work at Batu Karang, including the transfer thereto of the electric power generated at that section and formerly used at the Kranji Section. Surfacing of the new main road deviation is now well in hand, and should be completed by the end of the year.

International Tin Agreement

The International Tin Agreement came into force on July 1, 1956, and the first requirement is that steps be taken to accumulate an initial Buffer Stock of 15,000 tons metal by means of contributions by producer members either in tin metal or its cash equivalent.

Malaya is contributing entirely in cash, which is being recovered by Government from the individual producers by means of a cess on their monthly receipts from ore sales and varying with the price of the metal.

Taxation

The Finance Bill recently published contains provisions regarding tax reliefs to be given to what are termed Overseas Trade Corporations. It seems reasonably clear that this Company will qualify, but it is too early yet to give any indication of the extent of the benefits.

Future of Malaya

On August 31 next Malaya becomes a self-governing member of the Commonwealth. The Chief Minister and other Ministers of the Federation of Malaya have given repeated assurances that British Capital for mining will be welcomed and that British companies operating in Malaya need have no fear of discriminatory legislation or policy. There are bound to be some initial difficulties and a need for a sympathetic understanding of the task which lies before the Government of a newly independent Malaya.

Closing prices and turnovers for the week on the London Metal Exchange are given on page 56.

LONDON METAL AND ORE PRICES, JULY 11, 1957

ORES AND OXIDES

Bismuth	30% 5s. 0d. lb. c.i.f.
	18/20% 1s. 3d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semifriable) 48%	£17 8s. 0d. per ton c.i.f.
,, Hard Lumpy (45%)	£17 8s. 0d. per ton c.i.f.
,, Refractory 40%	£12 15s. 0d. per ton c.i.f.
,, Smalls 42%	£16 5s. 0d. per ton c.i.f.
Baluchistan 48%	£12 0s. 0d. per ton f.o.b.
Columbite, 65% combined oxides, high grade	185s./197s. 6d. per unit
Fluorspar—	
Acid Grade, Flotated Material	£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF_2)	156s. 0d. ex works
Lithium Ore—	
Petalite min. 3½% Li_2O	40s./50s. per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O	40s./50s. per unit f.o.b. Beira
Amblygonite basis 7% Li_2O	£26 5s. per ton f.o.b. Beira
Magnesite, ground calcined	£28 0s./£30 0s. d/d
Magnesite Raw (ground)	£21 0s./£22 0s. d/d
Molybdenite (85% basis)	8s. 5d. nom. per lb. (f.o.b,)
Titanium Ore—	
Rutile 95/97% TiO_2 (prompt delivery)	£56/£58 per ton c.i.f. Aust'n
Ilmenite 52/54% TiO_2	£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)	115s./120s. per unit c.i.f.
Manganese Ore Indian	
Europe (46%-48%) basis 130s. freight plus 5% surcharge	131d./133d. per unit c.i.f.
Manganese Ore (43%-45%)	106d./108d. per unit c.i.f.
Manganese Ore (38%-40%)	100d./102d. per unit (including duty)
Vanadium—	
Fused oxide 90-95% V_2O_5)	£12½-£13½ per unit c.i.f.
Zircon Sand (Australian) (65-66% ZrO_2)	£19 per ton c.i.f.

METAL PRICES

Aluminium, 99.5%, £197 per ton
Antimony —
English (99%) delivered, 10 cwt. and over £210 per ton
Crude (70%) £200 per ton
Ore (60%) bases 23s. 6d./24s. 6d. nom. per unit, c.i.f.

Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 12s. 0d. lb.
Cerium (99% nett), £13 18s. lb. delivered U.K.
Chromium, Cr. 99% 7s. 2d. lb.
Cobalt, 16s.-19s. lb.
Germanium, 99.99%, Ge. kilo lots 3s. 4d. per gram
Gold, 250s. 9¾d.
Iridium, £27/29 oz. nom.
Lanthanum (98/99%) 15s. per gram
Manganese Metal (96%-98%) £310
Magnesium, 2s. 5¼d. lb.
Nickel, 99.5% (home trade) £600 per ton
Osmium, £20/22 oz. nom.
Osmiridium, nom.
Palladium, £7 10s./£8 0s. oz.
Platinum U.K. and Empire Refined £34 oz.
Imported £31 5s./£31 15s. nom.
Quicksilver, £90 ex-warehouse
Rhodium, £42 oz.
Ruthenium, £15/£17 oz. nom.
Selenium, 75s. nom. per lb.
Silver, 78¼d. f. oz. spot and 78d. f'd.
Tellurium, 15s. 16s. lb.